Gas Journal

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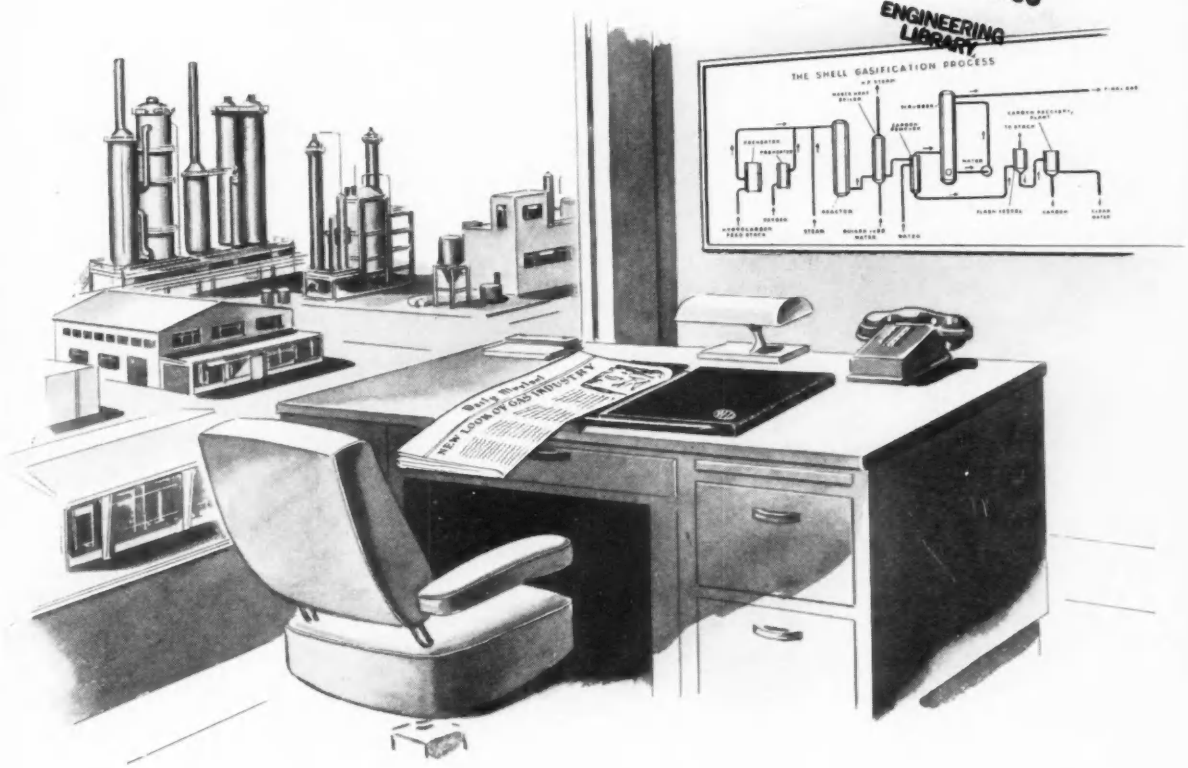

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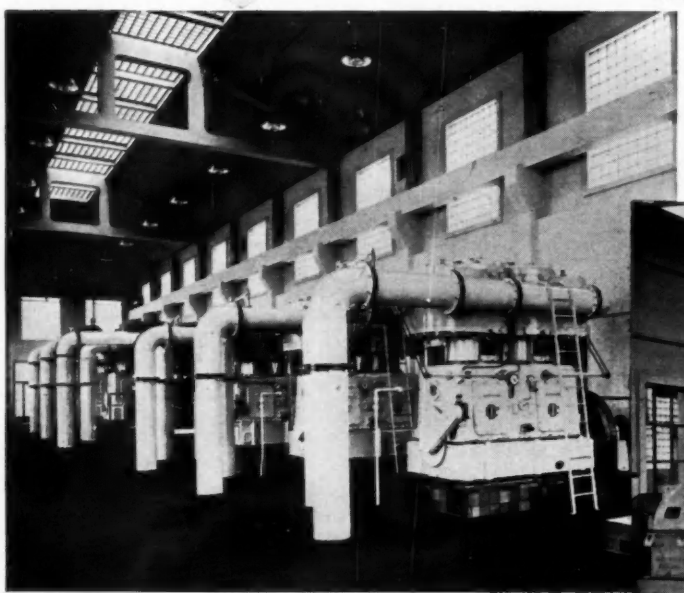

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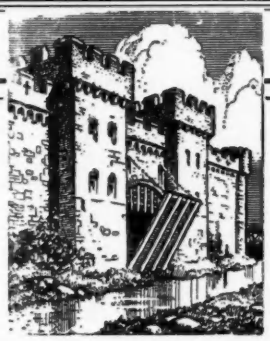

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Gas Journal

VOL. 294 NO. 4953 18 JUNE, 1958

110TH YEAR

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something in common

They remind one of different worlds, the Spanish forged iron pistol of 1850 and the modern T.G. meter. Yet, they have something in common—both are the products of true craftsmanship. The pistol delicately engraved and inlaid with damascene, designed and made by Eusebio Zuloago of Madrid, is presented as a fine example of the gunsmith's skill. The T.G. meter epitomizes craftsmanship and the T.G. 'G' prepayment mechanism is accepted as the most modern precision movement on the market.
Something else in common, this Spanish pistol and a T.G. meter were both exhibited at the Great Exhibition of 1851.

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Gas Journal

VOLUME 294. No. 4953. JUNE 18, 1958. 110th YEAR

COAL: The Problem Facing the N.C.B.

FOR one reason or another, but mainly because of the announcement concerning its freedom from rationing and price control, coal has been much in the news of late. This week we are devoting our editorial columns to certain developments in the coal industry which appear to us to be of importance. We turn first to the National Coal Board's Report for 1957.

It is impossible to extract much satisfaction or encouragement from a perusal of this report. Output of saleable coal from mines and opencast workings, far from showing signs of rising to the promised 240 mill. tons by 1960, seems to be stagnant at 224 mill. tons. The figures for the five years 1953-57, to the third significant figure, are 224, 224, 222, 222 and 224 mill. tons respectively; and this in spite of an increase of manpower to 710,000 (6,600 over that in 1956). Output from the mines, at 210 mill. tons, was the same as in 1956. True, it had shown an increase of 2.2% up to the end of May, when it was running at the highest rate since the vesting date. But the influenza epidemic reaching its peak in September and October reduced output by 1.5 mill. tons—not so great as the effect of unofficial stoppages which cost 1.8 mill. tons. And this stagnation was in spite of such technical advances as increased power-loading at the coal face which, we are told, made rapid progress during the year.

The cost of production at the collieries was 81s. 6d. per ton against 74s. 5d. in 1956; opencast coal cost 58s. 5d. to produce. Proceeds from the sale of mined coal averaged 82s. 1d. per ton, but allowing for interest and interim income payable to the Minister of Power the final result of the year's working was a deficiency of £5.3 mill. The relatively high price paid by the gas industry is shown by the facts that the average pithead price per ton was 97s. 5d. to the railways, 96s. 3d. to the domestic consumer, 95s. 2d. to the gasworks (the same to coke ovens operated by the Board itself), 68s. 4d. to the electricity works.

Coal to gasworks at 26.4 mill. tons was 5% down on 1956, while to coke ovens at 30.7 mill. tons it was 4.8% up. Coke and breeze produced at the Board's own coking plant was 8.1 mill. tons compared with 7.7 mill. in 1956. The cost of production is given at 190s. 1d. per ton with proceeds from the sale of coke and byproducts at 210s. 6d. per ton of coke produced. The production of manufactured fuels, including 'phurnacite,' was not so successful, incurring a loss of £152,000 during the year on a total production of about 1.88 mill. tons. Coke oven gas disposals rose to 58,000 mill. cu.ft. as against 53,000 mill. in 1956.

Interesting further development in the drainage of natural gas from coal seams and the surrounding strata is mentioned under the heading of 'Safety Research and Development,' since this is the deadly 'fire damp" of the coal mines. The total number of installations now at work is 46 with a volume of gas recovered amounting to about 11.5 mill. cu.ft. per day. In several places, as readers will know, these supplies are received by the gas industry. Mr. Mervyn Jones, in his contribution to the recent interesting *Times* Supplement on the Future of Gas, states that 'the total methane' (from the mines) 'taken by the" (Wales) 'Board represents 2.2% of its total sales.' And this development goes on.

Items on the Board's programme of research and development of underground plant are of great interest to the mechanical engineer. Power-loading machines, strata control (roof supports) and the support of underground roadways are, of course, specialised lines, but problems of conveyor transport are paralleled in many other fields of mechanical handling. One would like to know more about 'the armoured flexible conveyor.' The problem of the very long belt conveyor arises out of the fact that in the conventional design the belt carrying the load also transmits the power. Many years ago it was suggested that the power might be transmitted by wire ropes running alongside or underneath

the belt. It is interesting to note that the Board's technicians in collaboration with manufacturers are actively developing this promising idea. 'By the end of the year 17 cable belt installations were working successfully and others were being installed.' Other ideas, developments of course of older ones, are the covered steel band and articulated troughed steel plants.

A very important item in the report is the problem of large coal. The main factors for the increased breakage of coal are said to be in increasing use of explosives and the more widespread use of mechanised methods of getting and transporting coal. With regard to the former an attempt is being made to limit the depth and spacing of shot holes and the amount of explosive used. But more interesting is the introduction of alternatives in the shape of compressed air and 'the infusion of water into the coal face before blasting.' It is claimed there was evidence that the measures are starting to show results.

But the shortage of large coal, 'over about 2 in. in size,' remains. Supplies of large coal for gas-making fell from 4.1 mill. tons in 1947 to 2.7 mill. tons in 1957. And it is evident that the Coal Board welcomes developments in the gas industry tending to the increased use of small coal.

Coal Merchants on the Defensive

Having commented on the coal mining situation and factors affecting the supply of what is still the gas industry's principal raw material (although to read current literature one can easily forget it!), we turn now to the distribution side. Here the dominant factor is the possible result of the end next month of coal rationing and price control, which was announced last week. In future people may buy coal from whichever merchant they choose, without registration, and prices will be competitive. An increase in the price of all grades may be expected very shortly and would probably have come anyway, irrespective of derationing. More significant, however, is the likelihood of merchants widening the price differential between large and small coal.

With regard to price, contrary to the general belief, the Government appears to take the view that the end of price control does not imply any general increase in prices. When questioned on this point in the Lords, the Minister of Power said he appreciated the anxiety that increased prices should not result and added: 'That is one of the objects of the removal of control, to let competition exercise its influence.'

We have said there is still a shortage of house coal, although small coals are in good supply; it seems probable, and certainly desirable, that the householder should be given some financial inducement to use the latter and invest in appliances capable of burning them efficiently. In this business of diverting the consumer from using large coal two factors may be mentioned. One is the growing popularity of briquetted fuels which can be used satisfactorily on various appliances of the improved type; the other is the rapid increase in the sale of medium sized coals which also depend for their popularity on the widening use of convector heaters. Although the householder's consumption of large coals has fallen by only 2 mill. tons, while his share of the total large coal output has increased from 47% to 54% since 1947, this 2 mill. tons is accounted for by a fall in total household consumption resulting from a swing towards other fuels for space heating.

In view of the Government-sponsored efforts which are being made to encourage the public to use 'clean' fuels, one might have supposed that this trend would have met with official approval. Perhaps it does, in a way, but somebody might ask the Minister of Power for his comments on the strong probability of a national advertising campaign for coal, sponsored by the National Coal Board. If this is a co-ordinated fuel policy, we give up!

The fact is, of course, that for the 17,000 coal merchants in the United Kingdom derationing and the lifting of price control have come as something of a jolt. This is not an efficient industry. Coal distribution is carried out in a wasteful and primitive manner; most merchants 'muddle through' without any real planning —although one has to admit that the vagaries of the N.C.B. and the British climate combine to produce a formidable problem; and in our experience only a handful have the technical knowledge, or apparently the desire, to ensure that their customers get the best results from their fuels and appliances.

Obviously it is the more progressive merchants—usually the large ones—who will make the best of the situation. They will be able to afford mechanical handling devices which can cut their costs and therefore enable them to offer coal at the most attractive prices. It seems reasonable to expect a certain consolidation among merchants, leading to shared depôts and a more streamlined organisation. This in turn will lead to more advertising by merchants, although indications are that we cannot expect national advertising yet awhile.

Perhaps in an attempt to make coal more attractive to the housewife it will be coloured, an experiment which has apparently met with some success on the Continent.

For some time now the Coal Utilisation Council has been discussing ways and means of popularising coal. Significantly, we have seen no reference to the way in which merchants might maintain and even increase their business by selling coke in a determined manner; perhaps that would be considered a disloyalty to Grandpa N.C.B., by whom this organisation and indeed the whole industry seems dominated. There is really no reason for this domination—after all, both gas and electricity depend primarily on the N.C.B. for their raw material, but this does not inhibit their competitive activities.

The present situation lends additional emphasis to the pressing need, recognised fairly thoroughly in the gas industry today, for replacing coal by gas and coke in heating the homes of the people. This is a load which both the gas and electricity industries covet, but potentially it is large enough to give both parties a good-sized slice of business. Hitherto both industries have been fighting the stubborn conservatism of the British householder and, to a lesser extent, a price ratio which favoured bituminous coal. Today we have an additional factor—a coal industry which is prepared to fight in its effort to turn back the clock. That it has no logical argument for so doing is by the way; it is motivated by the most powerful instinct of all—self preservation.

Personal

MR. ROBERT HOLLAND has been appointed Lincolnshire Divisional Sales and Service Manager by the East Midlands Gas Board. Mr. Holland, who is taking over from MR. GEORGE DAVIES, joined the industry in 1940 as a pupil engineer to MR. C. C. WOOD at Wellingborough. In 1944 he was appointed Manager of the Market Rasen New Lighting Co. and assisted in the management of six of the works controlled by his father. Of these, Daventry, Thrapston and Desborough are now in the Board's area. In 1951, Mr. Holland was transferred from Market Rasen to Barton-upon-Humber as Manager, and in 1954 became wholly associated with the commercial side as Sales and Service Officer to the Scunthorpe Group. After a Gas Council course at Weybridge, Mr. Holland was appointed District Manager at Heanor in 1956.

MR. SAMUEL DAVIES, District Manager for the East Midlands Gas Board at Doncaster since 1952, is to retire next month. His successor will be MR. ROBERT WRIGHT, District Manager at Worksop. Mr. Davies, who is 64, will become a lay pastor at a Yorkshire Congregational Church not far from Doncaster.

MR. BORIS MAMERS, who came to this country 11 years ago as a refugee from Estonia and after starting work at the Chesterfield works of the East Midlands Gas Board as a stoker-labourer, became senior technical assistant at the works, has been appointed Divisional Chemist for the Board's Lincoln Division. He leaves Chesterfield to take up his new duties on July 1. Since settling here he has taken a number of examinations and about 18 months ago obtained the Diploma of the Institution of Gas Engineers.

MR. R. M. WARDROP is Manager of the Scottish area office of Evershed & Vignoles, Ltd., at 13, Rutland Street, Edinburgh, following the company's decision to have direct representation in the country.

MR. ALAN BOVINGTON, an Assistant Distribution Officer with the North Thames Gas Board, is in the U.S., to attend a 'summer school' course at the Institute of Gas Technology, Chicago. He was chosen for this visit by the Institution of Gas Engineers through the Woodall-Duckham educational fund.

MR. A. A. H. CLARK has been appointed by the North Thames Gas Board as Senior Assistant Engineer at their Nine Elms works in succession to the late MR. W. A. J. DAVEY, who had been at Nine Elms for 33 years.

MR. A. E. ARRIS, of Newcastle-upon-Tyne, and MR. K. BURDETT, of Sheffield, have been appointed by the Nuralite Co., Ltd., to represent the Company in the Northern region.

MR. P. B. WARD has been appointed Sales Manager by Technical Designs, Ltd.

Obituary

SIR GEORGE EVETTS, O.B.E., who was elected an Honorary Member of the Institution of Gas Engineers in 1953, died last week, aged 75. He had served the gas industry over a very wide field in a long and distinguished career. Educated at Masons College and at Birmingham University (where he was Chamberlain Scholar), he was for a time in the City Engineer's office at Birmingham and Westminster, and became assistant to Mr. Henry E. Jones and to Mr. Frank H. Jones. For 21 years a consulting gas engineer practising in Palace Chambers, Westminster, he became A.M.I.C.E. in 1908 and M.I.C.E. 14 years later. In the second world war he was created a Knight Bachelor in 1946, was Gas Adviser to the Board of Trade, Gas Division, and later to the Ministry of Fuel and Power. He was also Chairman of the Advisory Committee on Benzole Recovery, Assistant Director of Compressed Gases (Air Ministry), and became a Liveryman of the Worshipful Company of Wheelwrights and a Freeman of the City of London. He had been engaged by many companies and local authorities from time to time in connection with constructional and administrative Parliamentary matters. His publications include *Administration and Finance of Gas Undertakings (1922)*, *Gas Legislation (1935)* and various technical publications and contributions to the technical Press. His paper on 'The Economics of Gas Production on a Thermal Basis,' read at the annual meeting of the Institution of Gas Engineers in 1925, gained for him the H. E. Jones London Medal. In 1933 he presented a paper to the Institution on 'Centralised Manufacture and Distribution of Gas in Belgium,' and during Mr. Frank H. Jones's Presidency of the Southern Association he gave a paper on tariffs. He was at one time Chairman of the Joint Committee on Rates of Depreciation appointed by the Gas Council. Sir George, who was presented with the O.B.E. in 1943, three years before receiving his knighthood, was a Director of many gas companies before nationalisation. He was a director of a number of British-owned overseas undertakings, including the Colombo and Hong Kong and China. Until it went into liquidation he was also a Director of the Malta and Mediterranean Gas Company.

Diary

June 20.—SCOTTISH WESTERN JUNIORS: Greenock Golf Course. Annual Golf Outing.

June 21.—EAST OF SCOTLAND JUNIORS: Perth. Annual Outing.

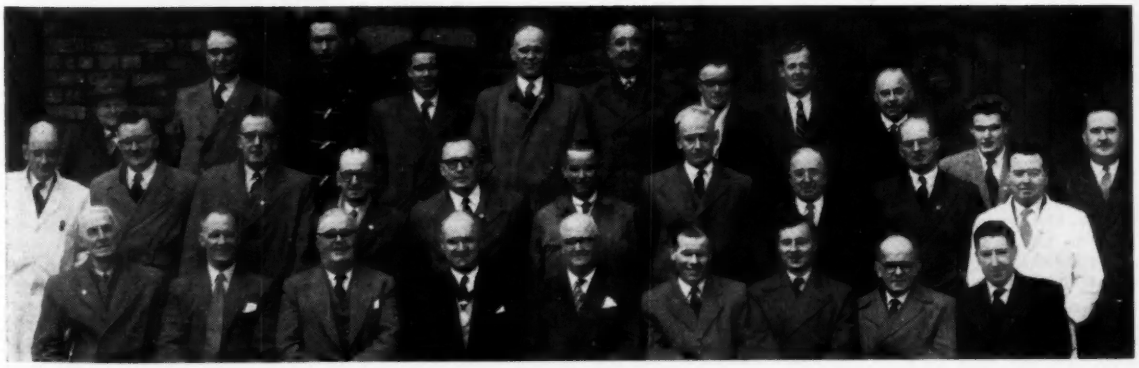
June 24-26.—INSTITUTION OF CHEMICAL ENGINEERS: Olympia, London, W.14. Symposium on the organisation of chemical engineering projects.

June 25.—WALES AND MONMOUTHSHIRE JUNIORS (NORTH WALES SECTION): Ladies' Day.

June 25.—I.G.E. (SOUTH WESTERN SECTION): Gloucester. Summer Meeting and Ladies' Day.

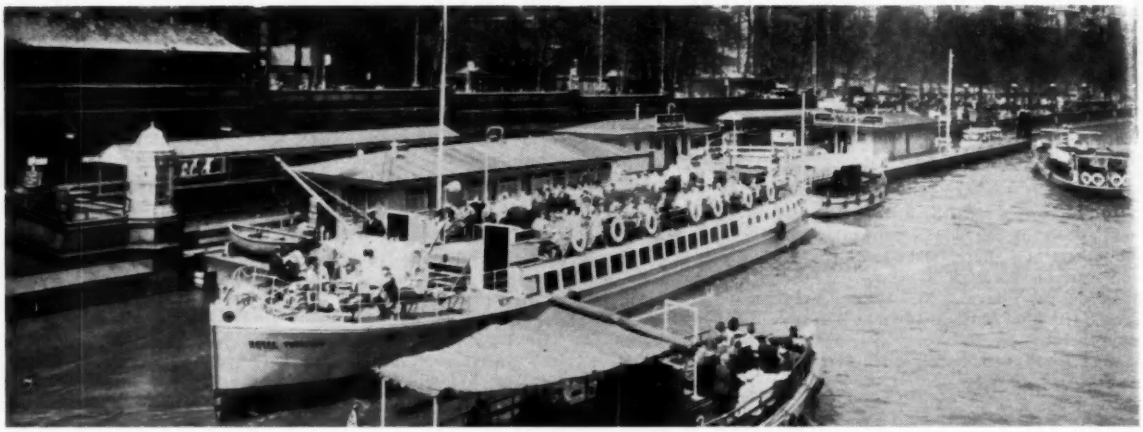
June 26.—NORTH THAMES G.C.C.: Westminster City Hall, Charing Cross Road, W.C.2.

July 1.—EAST MIDLANDS G.C.C.—Smithy Row, Nottingham. Annual General Meeting, 11.30 a.m.



Pictured above are members of the Yorkshire Junior Gas Association during a recent visit to the works of J. H. Robinson & Co. (Liverpool) Ltd. Mr. E. S. Carter, President, was among those present and the party was taken to the West Derby Golf Club for lunch, shown round the works during the afternoon and entertained to tea at the works before leaving.

GAS IN A FLOATING KITCHEN ON THE THAMES



BUSIEST terminus for the Thames launches which carry millions of passengers up and down London's river throughout the summer months is Westminster Pier. From this riverside rendezvous, pictured above, crowds of sightseers and holidaymakers embark for trips up stream as far as Windsor and down as far as Gravesend.

Operating from it is the fleet of diesel-engined vessels, notable for their graceful lines and impeccable cream paintwork, owned by Thames Launches Ltd. On a sunny summer morning you may see ten of these launches leave the pier, each with a full complement of 200 passengers.

In addition to maintaining a regular 'bus service' on the river, the launches are frequently chartered for private parties, educational tours, firms' summer outings, and similar functions.

Luxury vessel of the fleet is the m.v. Queen Elizabeth, a favourite for luncheon parties, dinner dances, and receptions of all kinds. But all vessels available for hiring have first-class catering facilities, and if required a full scale banquet meal can be served to guests on board.

Out-of-the-Ordinary

And that brings us to an out-of-the-ordinary job of gas supply which has just been carried through by the North Thames Gas Board's Headquarters Division's catering section.

Up to last month the food served aboard these launches was cooked in the kitchens of a catering establishment in Marylebone, brought in special containers to Westminster Pier, and taken aboard from there.

Now, however, a new kitchen has been built on the pier itself. And the food is cooked there in gas ranges, as may be seen from the picture in the centre of the page.

That may not sound unusual—until you realise the pier is a floating pontoon that rises and falls with the tide, the maximum difference in level being 25 ft.

The problem to be overcome, therefore, was how to run a gas supply from the Thames Embankment on to the pier allowing for this rise and fall.

It was found that, by running the supply down the side of the gangway connecting the pier to the Embankment steps, a rise-and-fall allowance much less than 25 ft. would be needed. For the top end of the gangway is pivoted, while the lower end moves to and fro along the pier pontoon as the river level varies with the tide.

So the job was carried out with two special flexible gas-connections, one at each end of a rigid supply carried down the gangway. On the pier itself the supply is again rigid and is carried inside the pontoon to the kitchen point.

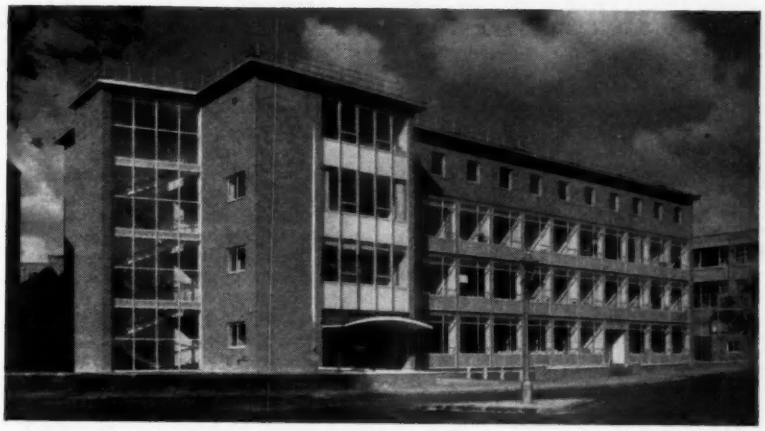
The small picture shows the meter in its housing (opened for the photographer) fixed neatly under the river side of the Embankment parapet, from which a special flexible connection runs to the rigid gas-supply carried down the gangway to the new kitchen on the pier. This rigid supply is seen at bottom right of picture, running at the side of the elbow-jointed pipe which brings fresh water to the pier kitchen.

As an incidental to the job a special cradle for the meter was made in the Board's workshops at Watson House.

This job and the fitting up of the gas-equipped kitchen on the pier were completed in time for the opening of the summer season on the river.

Now the kitchen is kept busy preparing for for the dining saloons and buffets of the fleet of Thames launches. The Thames river services carry about 2 mill. passengers a year. Well over half of these passengers, it has been estimated, embark at Westminster Pier.

Electricity Chief Opens Evershed & Vignoles Office Block



THE new office block of Evershed & Vignoles, Ltd., pictured here, was opened in Acton last week by Sir Christopher Hinton, Chairman of the Central Electricity Generating Board.

Introduced by the Chairman of the Company, Mr. J. C. Needham, Sir Christopher drew attention to the fact that British instrument firms now occupied a leading and outstanding position in a field which before the war was dominated by America.

Centralised Control

He was certain, said Sir Christopher, that technically there would be no difficulty within the next few years in putting chemical and other process plants under centralised control where the plant could be looked after virtually by one man who watched the controls which did the whole of the manipulation of the plant.

But while automatic controls today—and for a long time to come—would look after the plant when it was operating normally or within certain narrow limits of departure from normality, when, through some abnormal circumstance, the plant ran beyond those limits, a skilled man would have to be available to deal with the abnormal circumstances and return the plant to where the controls could operate.

Question of Economy

The problem was not so much whether this could be done as whether, or to what extent it was economical, and how, when it became economical, the plant management was to be kept mentally alive during the 99% of the time the controls were looking after the plant, so that they would be alert during the remaining 1% of the time when conditions went beyond the controls.

The extension of developments in this field, therefore, depended as much on human and psychological factors as technical factors.

£84,000 PROJECTS

Projects totalling £84,410 approved by the Scottish Gas Board were reported at a meeting of the Scottish Gas Consultative Council in Glasgow. The district figures were: South-West, £33,617; Glasgow and West, £19,780; Central, £19,424; Aberdeen and North, £6,212; Edinburgh, £5,377.

OIL STRUCK

Oil has been discovered near Corringham, five miles from Gainsborough, Lincolnshire, in sufficient quantities, it is believed, to be worth exploiting, by the British Petroleum Exploration Company.

37-ton Holder Moved 14 Miles

A SMALL gasholder weighing 37 tons has been moved 14 miles from Haverton Hill-on-Tees (Durham) to Guisborough (Yorks) by the Northern Gas Board.

It had been used at Haverton Hill to augment supplies at peak periods, but is no longer needed there. It will be installed at Guisborough where demand has risen by 60%.

It is 37 ft. long, 18 ft. in diameter and 19 ft. 6 in. high.

BRITISH OXYGEN EXTEND THEIR CORBY FACTORY

BRITISH OXYGEN GASES, LTD., extensions to their factory at Corby, Northamptonshire, include a new equipment sales store together with a medical gas filling shop and stores, an oxygen filling dock, a cylinder test shop and a garage for 17 vehicles.

Occupying an area of 7,200 sq. ft., the buildings cost about £45,000. The architect and main contractor was British Oxygen Engineering Ltd., heating installations being undertaken by Lorne, Stewart, Ltd., and electrical work by Thorn and Hoddle, Ltd. Among the features of the building are the fibreglass roof lights and a double-sheeted asbestos roof.

Red Hot Interest

Unexpected visitors to the Building Trades Exhibition in Cardiff last week, at which the Wales Gas Board had a stand, were a Russian trade delegation. They examined all the latest water heating and space heating appliances and expressed keen interest in the Flavel Spacemaster cooker. The automatic ignition and controls caused particular interest.

MANCHESTER AND YORKS JUNIORS MEET IN HULL

THE annual joint visit of the Yorkshire Juniors and the Manchester Juniors took place at Hull this year when both Sections were the guests of the North Eastern Gas Board.

A programme full of interest and allowing no time for speeches started with lunch in the city. This was followed by a view of the King George Dock, a small part of Hull's 12 miles of quays, and then a visit to the North Eastern Board's Bankside works to inspect the newly commissioned Gastechnik plant and the nearly completed sulphur extraction plant.

Tea in the works canteen completed the day. An extremely brief 'thank you' was spoken by Mr. E. S. Carter and Mr. J. K. Lord (Presidents of the Yorkshire and Manchester Juniors, respectively).

COAL AND STEEL

The coal and steel situation in the United Kingdom and the countries of the European Coal and Steel Community was considered at the seventh meeting of the Council of Association between the United Kingdom Government and the High Authority of the E.C.S.C. The Council instructed its Coal Committee to consider mutual trade in coal between the United Kingdom and the community on a long term and if possible on a permanent basis. It also instructed its Committees to keep the market situation under close review.

73 Works Closed

Up to May 2 this year 73 works have been closed in Scotland, the latest including Carnoustie, Cumnock, Forfar, Kennoway, Johnstone, Auchinleck, Catrine, New Cumnock, Buckie, and Cullen.

Aberdeen gets new c.v.r. installation, coke screening plant, and 3 mill. cu. ft. gasholder

THE largest single capital development project ever undertaken by the gas industry in Aberdeen—the total cost was approximately £500,000—was inaugurated on June 9. It consists of a new continuous vertical retort installation and a new coke-screening plant at the gasworks in Cotton Street, and a new 3 mill. cu.ft. capacity gasholder at Tullos.

The plant marks the completion of a post-war modernisation programme which has doubled the pre-war gas producing capacity of Aberdeen gasworks, which can now produce 15 mill. cu.ft. a day.

The c.v.r. installation and coke-screening plant were inaugurated by Mr. Hector Hughes, M.P. for North Aberdeen. At Tullos, on the southern boundary of the city, Lady Tweedsmuir, M.P. for South Aberdeen, planted a tree to commemorate the completion of the new gasholder.

The retort installation, constructed by the Woodall-Duckham Construction Co., Ltd., consists of a bench of 16 103-in. major axis, downwardly-heated continuous vertical retorts set in a double line. The retorts are heated by four step-grate producers situated at retort house floor level on one side of the bench. Allowing for 12½% of the retorts to be laid off for scurfing, the net output is rated as 2,232,000 cu.ft. a day at 425 B.t.u. per cu.ft.

Independent Control

The retorts are housed in a steel-framed building with brick infilling, and provision is allowed for a similar installation to be built between the new installation and the plant completed in 1951.

Each retort is under independent control, being provided with its own producer-gas, secondary-air and waste-gas flue dampers. The coke extractor mechanism beneath the retorts is hydraulically driven by a vertical non-condensing steam engine with an electric motor standby.

With all 16 retorts working at their full capacity, the waste-heat boiler would be capable of generating 9,200 lb. of steam an hour at 100 lb. per square inch pressure from feed water entering at 60°F.

To maintain the draught necessary for the satisfactory working of the retort settings a 'Sirocco' high-efficiency, induced-draught fan is provided, capable of dealing with the whole of the gases passing through the boiler. The boiler is fed by either of two single-cylinder, direct-acting, steam-driven Weir pumps, each capable of delivering 1,450 gal. of water an hour against boiler pressure.

The railway sidings in the works were modified to suit the new plant, and the coal-handling plant is arranged in two streams, each of 100 tons an hour capacity. One stream is extended to deliver coal to the existing installations, and both streams are designed to feed any additional installations.

Coal is discharged from wagons by four electrically-operated end-discharge wagon tippers of the ram type, each capable of tipping end-door wagons up to 21 tons capacity into the two reinforced concrete receiving hoppers situated below rail level. From the receiving hoppers coal is fed to either of two belt conveyors by 'Locker-Traylor' electric vibrating feeders, one beneath each of the receiving hoppers.

The belt conveyors are driven by electric motors through totally-enclosed worm-reduction gearing, carrying the coal through a single-roll coal breaker, which can be by-passed if necessary to either of two gravity bucket conveyors. The coal is taken up by gravity bucket and delivered to either a shuttle-belt conveyor or to a belt conveyor which delivers to the main coal storage hoppers.

The reinforced concrete receiving hopper and the reinforced concrete underground conveyor pits were constructed by William Tawse, Ltd., Aberdeen, as sub-contractors.

Coke is extracted from the bottom of the retorts into 150 cu.ft. capacity discharge skips mounted on independent chassis so that they can be dealt with by the existing overhead electric telpher machine, or discharged into either of the two new coke-receiving hoppers. The skips are propelled by electric-battery-operated haulage locomotives, the batteries being recharged in the battery-charging room.

Coke-screening Plant

From the coke-receiving hoppers coke is elevated to the coke-screening plant by a fully-automatic 40-tons-an-hour twin skip hoist discharging into a coke buffer hopper. From the buffer hopper the coke is distributed by a three-way chute through rotary coke feeders to either of two Pegson single-deck scalping screens or to belt conveyor. Each scalping screen separates the over 1¼ in. from under 1⅛ in., the latter being separated by a Pegson single-deck debreezing screen into breeze and ¾ in. to 1¼ in. size coke. The over 1¼ in. size is fed to a Jenkins vibratory screen where separation into 1⅛ in. to 1¾ in. and over 1¾ in. is attained. The various sizes are fed into four reinforced concrete storage hoppers, from which the coke can be loaded into rail transport in bulk or to road transport in bulk, or in bags weighed by a Belle Isle type weighing machine, the coke being taken over twelve final debreezing screens.

The reinforced concrete storage hoppers were constructed by W. J. Anderson Ltd., as sub-contractors.

The new gasholder of the four-lift spiral-guided type, of riveted construction erected in a steel tank placed at ground level, has a capacity of 3 mill. cu.ft. The total height of the holder when fully inflated is 178 ft. 10 in., and the diameter at the base is 180 ft. 6 in. When fully inflated, the maximum pressure thrown is 14.5 in. w.g. and the minimum pressure 6 in. w.g.

The holder was constructed by Newton, Chambers & Co., Ltd., on a foundation laid down by W. J. Anderson, Ltd. The foundation consists of a 12-in. thick reinforced concrete slab, 182 ft. 6 in. in diameter, supported by 839 reinforced-concrete pre-cast piles, each 12 in. square, driven into a layer of bound gravel situated about 20 ft. below ground level.

New Boosting Equipment

The gas connections to and from the holder are 24 in. in diameter, with anti-flood pipes fitted to both inlet and outlet mains. Gas is pumped into the holder from the gasworks at Cotton Street, about three miles away, and is delivered to high- and medium-pressure mains by new boosting equipment provided at the site. This consists of two Holmes-Connersville high-pressure boosters, each of 250,000 cu.ft. an hour capacity, driven by 180 h.p. Blackstone diesel engines, and two medium-pressure electrically-driven fan boosters, each of 100,00 cu.ft. an hour capacity, supplied by Keith Blackman, Ltd.

Remote stock-recording and high- and low-level alarm equipment supplied by Evershed & Vignoles Ltd., is installed between the holder station and the gasworks, and high- and low-level cut-off valves are fitted as additional safety devices.

Speaking at the inauguration of the new plant, where Mr. Hector Hughes unveiled a plaque, Mr. Sydney Smith, Chairman of the Scottish Gas Board, said that it was the intention of the Board to provide for the citizens of Aberdeen the best possible service for both gas and coke, and they believed that the new developments now going into operation would enable them to carry out those intentions to the satisfaction of both existing and potential customers.

The inauguration of the new plant was followed by a luncheon in the Station Hotel, Aberdeen, attended by representatives of the Town Council and County Council, of important interests in the city, and representatives of the Scottish Gas Board and the Scottish Gas Consultative Council. Mr. Smith presided.

Aberdeen, he said, was now equipped with thoroughly up to date gas-manufacturing and coke-screening plant, both of ample capacity to meet increased demands.

'At a cost of £500,000, I think you

will agree that the Scottish Gas Board have clearly demonstrated a firm resolve to provide the best possible heating and cooking service for the inhabitants of this city. But we do not consider that these quite considerable improvements should mark the end of our efforts.

'We have over 60,000 consumers of gas and coke in Aberdeen, and they have the right to expect an equally efficient service in relation to the appliances they use in their homes and factories. And so, in addition to the modernisation which we have carried out in the production, separation, and distribution departments here, my Board have also acquired premises in Union Street which, in a few months' time, will be opened as a new service centre and divisional offices.

'In years gone by, such a place has been referred to as a showroom, but today we refer to a service centre because this emphasises a most essential part of the policy of my Board.'

Mr. Smith added that, following the recent opening of a service centre in Inverness, another one was to be opened in the near future in Thurso.

Mr. Smith concluded with a comment on the relationship between gas and electricity—'because our attitude is not always understood.' They were not against electricity as such, but, 'we do ask that whether he wants to use electricity or gas, every individual in this free world of ours should be given the freedom to choose the type of fuel he personally wants. We welcome competition, so long as it is fair competition; and I am sure that it will be recognised that, in local authority housing, a policy of freedom of choice for the tenants themselves is both fair for them and for the fuel industries concerned.'

The toast of the gas industry was proposed by Lady Tweedsmuir. The toast of the guests was given by Sir Robert Nimmo, Chairman of the Scottish Gas Consultative Council, Mr. Hector Hughes replying.

BALLOT TO DECIDE WHETHER NALGO SHOULD AFFILIATE TO THE TRADES UNION COUNCIL

—*But there must be 50% poll*

A PROPOSAL to affiliate to the TUC was presented to the National and Local Government Officers' Association's annual conference at the Isle of Man last week.

An amendment, however, called for a ballot on condition that at least 125,000 of the Association's 250,000 members take part in the voting. On a previous occasion only 73,151 votes were registered—and the proposal had been rejected by a small majority.

In spite of a considerable body of support conference did not accept a motion in favour of reconsidering using the strike weapon; one speaker expressed doubts that a NALGO strike would be successful due to apathy of members and the 'hardening of public opinion against strikes.'

Compulsory Membership

Another suggestion to strengthen the Association's powers was a proposal that trade union membership ought to be made compulsory in all services in which NALGO has members. This received a sympathetic reception and was referred back to the executive council who will consider it and report to the 1959 conference.

Gas industry delegates met before the conference under the presidency of Mr. F. Eade, South Eastern area.

Mr. G. W. Phillips, organising officer for gas staffs, reported. He said that foremost in everybody's mind was the matter of salaries. This year the Association had made an attack on the salary question from two angles: That of trying to keep pace with the rising cost of living and that of restoring differentials. The claim for the restoration of lost differentials put forward last autumn came up for consideration just after the Chancellor of the Exchequer made his famous speech about the need for restraint; they were faced not only with the rejection of the claim but with the fact that its very basis was questioned.

It was agreed that the joint secretaries should examine the staff side case and produce a factual report which would be used to determine whether there was a *prima facie* case for the claim to be considered. Mr. Phillips went on to describe the slow and involved procedure which had been followed; the pronouncement of the Gas Council against any increase of expenditure on salaries; and the decision of the staff side to secure a deferment of the matter until the autumn.

One aspect of the matter seemed to him more satisfactory—the staff side had drawn attention to the more favourable rates of pay of young people in other industries and as a result it had been agreed that the Gas Council would discuss junior scales before July. They could, Mr. Phillips thought, expect improvements.

The claim related to the cost of living was justified by the fact that at the date when the last award was operative (May 1, 1957) the index of retail prices stood at 104; when the new claim was put in the figure was 108; and it had since risen to 110. The claim was for such an increase as would compensate for the rise in prices. The need for such continuous applications was regretted. While the cost of living continued to rise, however, they were bound to take steps to obtain compensatory increases in salaries. The standard of living of their members should not go down.

Overtime Bonus

They had achieved improvements in the overtime bonus scheme, Mr. Phillips continued, to the extent that all overtime for which payment was made was to be paid for at the bonus rate of approximately one and a quarter times the flat rate. They had tried to bring all administrative, professional, and clerical staff into the system of paid overtime but had failed. They had tried, too, to get payment for the first hour worked beyond the normal; the employers had at least accepted the view that the working of one hour without payment ought not to be used as a device for extending the working week.

In their policy of seeking to get rid of the intermediate grades they had not always had the sympathy of their colleagues in the manual workers' joint councils who found some advantage to their members in that the existence of the intermediate structure made easier the passage from the manual worker to staff status; nevertheless, the manual workers were tending to come the way of the staff side of the National Joint Council. At the last meeting of the National Council the employers undertook to consider the salary scales within the structure to accommodate intermediate grade employees who were transferred to staff status.

Redundancy

There remained, Mr. Phillips went on, the most serious question of redundancy arising from reorganisation, the introduction of new methods, or new machinery. There were outstanding examples of co-operation between boards and staff sides in their approach to the problem of the resultant redundancy, but other boards showed a less liberal policy.

Turning to the subject of compensation for loss of employment, Mr. Phillips said that the National Staff Side had prepared proposals for an agreement to replace the Compensation Regulations of 1949 when these expired. The Gas Council had approached the Minister of Fuel and Power to ascertain the extent to which he would approve principles for dealing with the matter. The Minister had said there was nothing to prevent the two sides dis-

cussing compensation on the understanding that any agreement might require his approval.

On pensions, Mr. Phillips referred to the decision that intermediate grades should come within the newly formed manual workers' pension arrangements; the staff side had objected to the lack of consultation in the formulation of those arrangements but it seemed too late to seek any alteration in the scheme. In general his advice to any member of the intermediate grades was to enter the new scheme, which would provide benefits which would accrue on transfer to the gas staffs pension scheme.

Education

The wide variety in the treatment given to education and training by the various boards was causing some concern, Mr. Phillips said. They had called for reports and made representations to the National Joint Council. With the introduction of new methods and machinery there was a danger, unless the industry trained its own people to meet the demands, that experts would be brought in from outside. The Gas Council took the view that education and training were matters for the area boards and area joint councils; it was up to staff organisations to draw attention to any lack in this respect and to stimulate greater activity.

A review of the progress and operation of joint consultative arrangements had been made, said Mr. Phillips. The staff side intended to present a memorandum to the National Joint Council urging the proper exercise of consultative functions; up till now it had been preoccupied with other business.

Replying to a question by Mr. H. Walton (Stoke-on-Trent), Mr. Phillips said that they could properly refer to the large measure of success in the electricity field in support of the salary claim for gas members.

Another delegate pointed out that an increase in bonus overtime rates increased the loss of differentials for those in the higher grades who are not paid for overtime. Mr. Phillips agreed but pointed out that they were never reluctant to accept benefits even for some members.

Answers to other questions revealed the outline of likely progress on salary claims. The cost of living claim was likely to be dealt with in July and that for junior staff probably at the same time; the 'differentials' claim would arise in October. Mr. A. Bailey (Manchester) wanted to know what NALGO would do if the cost of living claim failed. Unless they had a plan of action he thought the claim was frivolous.

Automatic Claim

Mr. W. Brain (Walsall) maintained that the claim had properly followed the rise in living costs in that it was automatic. Mr. T. Fernley (Manchester) denied that the claim was frivolous, if the Gas Council did not meet it reasonably, the staff side would have to consider further steps. Items on the conference agenda, he said, such as TUC affiliation and a strike policy for NALGO, were relevant to this.

Questions on redundancy in the gas industry and compensation for loss of employment revealed the deep anxiety in members' minds, but Mr. Eade, from the chair, maintained that in general the position was not unsatisfactory. Nine area boards had played ball with the trade unions. There had been differences but they had been overcome. It would be unwise to have a rigid national agreement on redundancy. On the other hand, they were making good progress in formulating a scheme of compensation.

Optimistic

Mr. A. Bailey (Manchester) deplored the fact that particulars of the compensation scheme had not been made generally known. Mr. Phillips explained that they had only reached the stage at which the Gas Council was considering staff side proposals and was seeking the views of the Minister of Fuel and Power on the principles.

An optimistic forecast of future relations with the British Gas Staffs' Association was made by Mr. H. Sutherland (Glasgow), who has long advocated unity between the two organisations.

New Method of Stacking Small Coal May Save N.C.B. £17 mill. a Year

A METHOD of storing small coal which, according to Mr. Ewart J. Penfold, who devised it, might save the National Coal Board up to £17 mill. a year was explained at a recent conference in London.

At present, such small coal is stacked, on the advice of the Coal Board's own scientific department, in heaps not more than 8 ft. high. Mr. Penfold proposes to stack the coal to heights of 16 or even 24 ft., and to prevent the risk of spontaneous combustion in these larger heaps by a method of stacking which would exclude oxygen from the heaps and by the use of a chemical sprinkler system to cool down, automatically, heaps which approached a predetermined temperature.

Representatives of the National Coal Board are to visit a storage place at Neasden tomorrow to examine the suggestions made by Mr. Penfold. The divisional boards themselves have the power to alter their storage arrangements without reference to the national board. Before deciding on the value of Mr. Penfold's proposals, they will probably have to consider whether the total amount of stored slack coal is likely to appreciate during the next seven years at the rate now expected. The National Coal Board hope that it will not do so and that it may, in fact, decrease.

NEW S.G.B. PHONE INSTALLATION HAS UNUSUAL FEATURES

AN unusual feature of the new telephone installation of the Southern Gas Board in Southampton is the interlinking of six order boards and a supervisor's panel to a private automatic branch exchange.

Immediately a customer rings Southampton 27611 a light flashes on all six order boards and one of the girl telephone receptionists not busy with another call answers immediately. All the girls are provided with certain basic information that customers may want, and they are able to take customers orders.

For information not immediately to hand the customer's call is held while the receptionist contacts other extensions to find the answer. These Southern Gas Board order boards are the first to be used in the area, and, the Board claims, are highly efficient.

The set-up was recently visited by G.P.O. officials from other districts in the Board's area to help them erect similar installations for the Board in their own territory.

GAS MAINS UNDER FACTORY FLOOR WILL BE FLOODED

A REINFORCED concrete 230-ft.-long culvert has just been completed to carry two gas mains under the factory floor of Glass Bulbs Ltd., Harworth, near Doncaster. In section, the culvert measures 5 ft. by 6 ft. It is designed as a water retaining structure and under operating conditions the whole is filled with water as a safety precaution.

At one end, the culvert passes under a railway line, and the lines are fixed into the roof slab with the unit suitably strengthened to carry the external load.

This is part of the Company's building programme for new administrative blocks and laboratories at their new factory, Horsforth, nr. Leeds. The building consists of an administration and a laboratory block joined together by a link block.

Bromyard Closes

Manufacture of gas at the Bromyard works of the West Midlands Gas Board has ended after a century of operation, and the town is now supplied with gas from Worcester through a ten-mile link main recently laid from Malvern which was already connected with the Worcester undertaking.

WALES AND MONMOUTHSHIRE SECTION

Spring Meeting at Llandrindod Wells

HOW to sum up the Spring Meeting of the Wales and Monmouthshire District Section held at Llandrindod Wells on June 5 and 6? Probably 'Local Boy Makes Good' ties up the meeting as neatly as anything, the 'Local Boy' being Mr. E. M. Edwards, whose election to the Presidency of the Institution of Gas Engineers has been rightly interpreted in Wales not only as recognition of an outstanding member of the industry, but as an honour to his country.

Indeed, the Chairman, Mr. I. W. Thomas, opened his address by referring to Mr. Edwards. 'Our Section can be justly proud that we have with us today a former member, hon. secretary, and president, who has recently brought the highest possible distinction to our section by being elected President of the Institution of Gas Engineers,' he said.

The bulk of Mr. Thomas's address dealt with the history of the Aberystwyth undertaking.

'The Aberystwyth Gas & Coke Company was formed in January, 1838,' he said, 'with a capital of £4,000 under the trusteeship of "certain landed Gentlemen, including two Members of Parliament." Plans and estimates for the erection and completion of a gasworks were submitted by Mr. Morley Stears of Stroud. A site near the centre of the town, part of which is still occupied by the present offices and showrooms, was leased from the Corporation. Progress in construction was evidently rapid for in August, 1838, it is recorded that certain parts of the town adjacent to the works were lighted by gas for the first time, and the event was duly celebrated by an open invitation to the "Shareholders, inhabitants and others who may wish to dine on the opening of the new Gasworks."

Manager—£1 a Week

'The engineer and manager (that was his official title), a Mr. White, was appointed at a salary of 20s. per week and he had the assistance of a stoker-labourer who received 12s. per week and a lamplighter who received 5s. per week. Coal costing 10s. per ton plus 8s. freight and haulage came, of course, by sea from Cardiff, Newport, and even as far as Newcastle. Carbonisation took place in "stacks"—each containing two "D" shaped retorts. Coke produced was sold at 6d. per bushel and tar at 4d. a gal. or 6s. per barrel. For the waste lime 4d. per bushel was realised with 1d. per bushel for ashes. The price of gas was 14s. per 1,000 cu.ft. No meters were used originally, but these were installed shortly afterwards, being purchased from that now famous firm, then quite unpretentiously known as Mr. William Parkinson, Cottage Lane, City Road, London.

'The local theatre was fitted with batswing burners in July, 1839, and it would appear that even in those days theatres had their financial problems, for in the following year the typical courteous letter was sent out to the proprietor: "... request payment of the sum due to the company for fittings, labour and fixing, which were procured at his earnest solicitation; they consider his delaying to discharge the bill to be unnecessary and vexatious and they hope ... etc." Thus was born the now more usual "unless" letter! However, by 1842, the concern was thriving and returning a dividend of £8% out of profits which were increasing yearly. But it was not until 1845 that the price of gas was reduced to 11s. 8d. per thousand cu.ft., falling to 10s. five years later and in 1851 down to 7s. 6d. "with a special rate of 5s. per thousand to the Mechanics Institute."

'About the 'seventies the gas undertaking eliminated from its title "and coke." The gas commodity was certainly going forward with great rapidity but apparently coke was something of an incubus. Gas cookery also began to find favour about 1890 and great difficulty was being experienced in meeting demands which by this time had risen to 30 mill. cu.ft. per annum and was still rapidly increasing. To add to the difficulties the lease, which the company held from the Corporation, was due to expire in a few years.

Spacious Site

'It was not, however, until 1898 that a final decision to build a new works was made and Mr. Henry Woodall, a member of a well-known family in the gas industry and himself an eminent gas engineer, was retained to advise the Company. There followed the presenting and passing of a Parliamentary Bill, the scheduling and purchasing of land adjacent to the railway and about one mile outside the town. Upon this new and spacious site a complete new works was constructed consisting of a horizontal retort bench with completely new ancillary plant and gasholders, and capable of meeting all anticipated demands for many years. In 1902 the old works ceased manufacture after 64 years expansive production.

'This new installation, in fact, satisfactorily met requirements until 1927 by which time output had reached 89 mill. cu.ft. per annum, and additional manufacturing plant was again required. It was then decided to install a modern installation of W.D. vertical retorts capable of producing 600,000 cu.ft. per day. The total cost of the installation, complete with coal elevating plant, waste heat boiler, gas engine, etc., and including piled foundations was £16,507, and it is perhaps of interest that the contract was completed within 12 months of receipt of order! This was followed by the installation of ancillary plant capable of dealing with the increased throughput.

'Between the two major wars an increased output of 90% was realised and the Company, for a short period, were able to boast of supplying the cheapest gas in Wales. By 1938, the local domestic coke market had increased and a coke screening and grading plant was installed. This development resulted in domestic coke requirements accounting for approximately 70% of available production. A benzole extraction plant was installed in 1940 to meet war needs and an output of some 20,000 gal. of crude benzole per annum was obtained.

'During the war years the increased demand for gas was quite remarkable. Aberystwyth was in a 'safe' area and the population increased greatly, due to the influx of evacuees from the danger areas. In addition, a number of military and Air Force establishments were set up in the town. Between the years 1940 and 1946 gas output increased by over 30%.

Uncertain Prospects

'With the end of the war the prospects for the post-war period appeared uncertain. The evacuees were departing from the town and military establishments were being closed down. The question was whether we would be able to hold our output. Apart from the gradual return of the students to the University and the ultimate re-establishment of the town as a holiday resort, there were no apparent alternatives to replace those loads we were losing. To our relief, however, we found that output levelled off and our war-time peak was maintained. This then was the position at vesting day.

'The advent of nationalisation had an adverse effect upon the competitive position of the undertaking with electricity. Until the nationalisation of the latter, the price of gas was appreciably lower than that of the locally generated electricity.

'The introduction by M.A.N.W.E.B. of an area board tariff, however, immediately reversed the position and we lost our most powerful sales weapon. This factor, combined with the effects of the continuing inflationary spiral, has made it increasingly difficult to operate the undertaking on a fully economical basis. The major increase was in the delivered price of coal (which has increased by 110%) and has been influenced by the disproportional increases in the pit-head prices of gas and steam coals which have been imposed upon us by the National Coal Board. Recurrent increases in labour charges, and indeed all other aspects of expenditure, have placed a severe burden on our resources which increased efficiency has not been able to recover.'

Mr. Thomas continued: 'It has been my privilege to act as Chairman to a group of small undertakings in Mid-Wales and it might be of interest to con-

sider the effects of the increases in the costs of the basic materials, labour, capital charges, and other essential expenditure which have been involved in the cost of production.

'Since vesting day this group has had to be heavily financed for the purpose of providing fixed assets in the form of plant, gasholders, showrooms, mains, services, meters, etc., and also for financing the inflationary measure of the rise in values of stocks and debtors. The annual charges in respect of this additional finance amounts to approximately £7,000, equivalent to 2.3d. per therm. Apart from mains, services and meters to new housing estates, no part of this substantial expenditure was incurred in order to expand supplies. Even in the case of new housing estates a large part of the consumption could be termed replacement consumption. Manufacturing costs have risen steadily since vesting day and the cost of gas into holder has risen by 6d. per therm above that at vesting date. Of this approximately 4d. a therm is accounted for by coal less residuals. Total cost of gas, excluding capital charges, has risen by 9d. per therm. On the income side the average yield per therm has risen from 16.74d. to 24.37d. per therm, an increase of 7.63d. per therm. Sales of gas have not increased sufficiently to enable the increased costs to be recovered by the increased prices. This margin amounts to approximately 2d. per therm plus the fresh capital charges of 2.3d. per therm.

'The gas industry, and our own Board in particular, is fully alive to this problem as the completion of grids in the North and South Wales coastal regions indicate. Clearly the pattern of our industry must inevitably follow that of all major industries by concentration of manufacture at large units. Only by centralisation can the gas industry ever hope to compete with electricity, an industry which has already a national grid.

The Only Solution

'I am, of course, fully conscious of the financial and practical difficulties involved in integrating many small and widely separated undertakings, but in the absence of any suitable type of plant, other than the traditional hand-charged horizontals, integration appears the only possible solution. It is perhaps open to doubt whether even then these undertakings will be independently economic, but at least some degree of stabilisation in costs will be achieved. This stabilisation will, of course, be extended to the quality and composition of the gas supplied, to the satisfaction of our consumers and the relief of the oft-times harrassed managers of our small works.

'Given equal suitability, price is still the most important factor in determining the choice of fuel and it is upon the price at which we can now—or maybe in the very near future—sell our main product, that our future expansion and prosperity will depend. The Minister of Power has expressed the opinion that the future of the gas industry depends upon its adopting methods of production which make use of hitherto little used or unused cheaper resources to produce gas at competitive prices. This statement implies that unless the price of our main product is reduced, or at the least stabilised, there is a real danger of our being progressively priced out of the market.

'To this end linkage of gas supplies and extension of grid mains is but one stage in improving production and distribution and ultimately reducing cost. The second feature is the search for methods of production alternative to the traditional processes of manufacture. Among these I would mention: (a) Increased usage of coke oven gas; (b) the exploitation of all possible available sources, including methane drainage from mines, oil refinery gas and natural gas; (c) the wider introduction of oil-gas plants; (d) the importation of liquid methane; and (e) the wider adoption of high pressure total gasification plants using low-grade fuel.'

Quite clearly, said Mr. Thomas, these methods provided sufficient evidence of the vitality of the industry and the search for new and cheaper sources of supply. The Wales Gas Board could be particularly proud that in this search for a cheaper therm they had progressed, probably more than any Board, in exploiting most, if not all, of these methods of supply; 92% of the total gas supplies was now being distributed through grid mains, which was no mean achievement in the short period since vesting date. This progressive policy of the Wales Gas Board was already showing encouraging results. Between 1950 and 1957 the Board had increased its total sales by 19% as compared with the national average of 6%. This upward trend, however, should not encourage a feeling of complacency.

'We Must Sell'

The Chairman concluded: 'These revolutionary changes that are taking place in our industry, however necessary to our survival, will be wholly ineffective if we, the managers, accept them as the panacea for all our problems. The prosperity of our industry is dependent not only upon a cheap source of supply, but equally upon our ability to sell the product that thus becomes available. So far as we are concerned the development of sales constitutes a prime function. We are all rapidly becoming sales specialists and, I believe, deriving a certain satisfaction in exercising new techniques in place of those which we originally acquired.

'I believe the spirit of progress is manifest in our achievements to date and the future is not without further challenges and attainments. We have confidence in our Board; we must justify their confidence in us.'

The Section's thanks to Mr. Thomas were expressed by Mr. W. Clark Jackson (Pembrokeshire Group) who spoke of his pride in the fact that both Mr. Thomas and Mr. E. M. Edwards had been his pupils. He had attended the first meeting of the Association in 1912; since then only three men from Wales had reached the status of President of the Institution. Speaking of the pattern of fortune described in the Chairman's address, Mr. Clark Jackson paid tribute to those whose foresight and skill had engineered the coming of grid gas which was bringing about a marked reduction in their losses.

There followed a paper by Mr. C. Fitton, Engineer and Manager at Neath, on 'A Gas-fired Installation for Summer-time Steam Raising'; among those contributing to the discussion was the Chairman of the Wales Gas Board, Mr. T. Mervyn Jones.

At the luncheon, Mr. E. M. Edwards, proposing the toast of the Section, referred to Mr. Clark Jackson who had remained a friend to all his pupils throughout the years. 'We talk of education today,' he said, 'but is not education also the encouragement, help and guidance you give a man through his life?' He spoke also of his student days at Neath with Mr. I. W. Thomas, who had been his friend for 30 years. He recalled that in 1910 Mr. A. W. Branson, father of Mr. W. R. Branson, had stressed the need for educational facilities to be made available to students and had arranged for classes to be held at Cardiff. Those facilities had brought rich rewards, but today education was still more important. 'We are in a period of dynamic change,' he said, 'and I am sure that the Wales and Monmouthshire Section will continue to give all possible help to the younger men on whom so much will depend.' They looked forward to the Institution visiting Wales next year.

Live Organisation

Responding, the Chairman said that although a small Section, the Wales and Mon. must continue to function as a live organisation. The encouragement to which Mr. Edwards had referred was symbolic of the Section and he hoped that this interest in the younger members would continue to be a feature of the Section's activities.

The prosperity of Llandrindod Wells was proposed by Mr. A. H. Dyer, the immediate past-Chairman, who spoke of the way in which the gas industry's fortunes were bound up with the fortunes of this town—and indeed any town in the area. Councillor C. G. Williams, Vice Chairman of the Llandrindod Wells U.D.C., replied and described how he had himself introduced a small industry into the town for which gas had been used in an enamelling process; he paid tribute to the co-operation which had been given to the project by the Wales Gas Board.

Mr. W. F. Edwards (Port Talbot) proposed 'Our Guests,' to which toast Mr. J. S. Smith, O.B.E., Assistant Secretary, Ministry of Power, responded.

In the afternoon members enjoyed the presentation of a paper by Messrs. H. B. Bassett and W. J. G. Bryce, Work Study Officers of Birmingham Division and Walsall Division respectively, who were visiting Wales at the invitation of the section. Their paper, 'The Application of Work Study in the West Midlands Gas Board' was in fact an extension of the paper which they presented to the Institution last year. Contributors to the lively discussion which followed included Mr. F. H. Bate, Chairman of the Midland Section, another visitor from the West Midlands area.

London Juniors' Subscription is Raised

BUT IT'S VALUE FOR MONEY, DECIDES ANNUAL MEETING

A PROPOSED increase of 10s. in the subscription brought forth unusual eloquence at the London Juniors' annual business meeting on May 30. However, the flights of oratory were confined to those who put the proposition; the meeting accepted the increase with the quiet resignation which is so much a feature of the British Way of Life. Members will in future pay £1 15s. for the privilege of being London Juniors—and, as all agreed, it is jolly good value for money!

Awards

Medal awards for the year were: The Society of British Gas Industries Silver Medal Award, 1957, was awarded to Mr. F. H. Cope for his paper 'The Quantities Involved in the Rating and Performance of Oxide Purifiers'; the President's Prize, 1957-58, was awarded to Mr. G. W. Heeley for his paper, 'Maintenance of Intermittent Vertical Chambers at Croydon,' read at the short paper meeting held on January 3; and the William Dieterichs Memorial Prize, 1957-58, was awarded to Mr. H. R. Cooke for his paper 'Industrial Applications of Air Heating by Gas.'

Officers for the coming session were elected as follows: President, Mr. C. H. Purkis; Senior Vice-President, Mr. R. K. Harrison; Junior Vice-President, Mr. P. J. Savage; Honorary Secretary, Mr. J. D. Grant; Honorary Assistant Secretary, Mr. C. P. Henshilwood; Honorary Transactions Secretary, Mr. J. E. Mills; Honorary Treasurer, Mr. D. G. Winslow; Honorary Assistant Treasurer, Mr. T. J. Basford.

Elected to Council

Messrs. H. R. Cooke, D. E. Crowther, J. R. Fairman, A. E. Livett, E. A. K. Patrick, A. P. Portchmouth, J. V. Rigg, and C. H. Townsend, were elected members of Council, while Mr. J. B. McKean, Past President, 1956-57, and Mr. J. E. Gray, Past President, 1957-58, became *ex-officio* members. Messrs. C. H. Purkis, President, 1958-59; R. K. Harrison, Senior Vice-President, 1958-59; and A. H. Savill, Past President, will represent the Association on the I.G.E. District Education Committee.

It was agreed that the usual donation of ten guineas be made to the Institution Benevolent Fund.

Mr. J. V. Rigg proposed a vote of thanks to the Technical Press; Mr. G. W. Battison, Editor of the 'GAS JOURNAL,' responded.

The business meeting concluded, three films were shown—the Power Gas Corporation's 'Gas Flow,' 'The Collier,' and 'All Lit Up.'

A feature of this year's Scotland's Own Ideal Home Exhibition, held at Waverley Market, Edinburgh, from April 30 to May 17, was a special building services exhibit on the Scottish Gas Board, Edinburgh, and South Eastern Division, stand. Pictured here is a central heating system operated by a Diplomat gas-fired boiler.

N.T.G.B. INSTALLS TRIP WIRE SAFETY SYSTEM AT POPLAR

THE Poplar works of the North Thames Gas Board has recently installed a new coal handling plant to carry coal from barges to the retort houses and stocking ground. A coal handling plant including mobile wharf side cranes and an efficient conveyor system was chosen to give flexibility of coal movement.

With this flexible but complex system which employs only a few men and has the main run of the conveyors out of view of the switch control room, it was necessary to include a suitable safety device which, in the event of an accident or other mishap, would immediately shut down all the conveyors in the particular group affected.

Many safety devices were considered, but after a trial installation had shown its advantages the Board decided to install the Huwood emergency trip wire system which would work in conjunction with the sequence arrangements provided by the normal control gear of the coal handling conveyors.

The Huwood trip wire system at Poplar has proved efficient in operation and has the complete confidence of the conveyor operators resulting from its simple but positive working.

Company Changes

ALTERED NAME

By special resolution of the Company and with the approval of the Board of Trade, the name of Parkinson & Cowan, Ltd., has been changed to Parkinson Cowan Ltd. The names of the three divisions of the Company now become: Parkinson Cowan Gas Meters, Parkinson Cowan Industrial Products, and Parkinson Cowan Instruments.

NEW ADDRESS

The Birmingham branch of the English Electric Co., Ltd., has been moved to Pitmaston, Moseley, Birmingham, 13 (telephone SOUth 4021/5). The domestic appliance sales section is also located in the new premises, but the appliance service depôt remains at 175, Tennant Street. Birmingham, 15 (telephone MIDland 2803.)

NAME AND ADDRESS

The firm of Honeywell-Brown Ltd. has changed its name to Honeywell Controls Ltd., and all head office departments and the London branch office have moved to a new building, address, Ruislip Road East, Greenford, Middlesex (telephone Waxlow 2333). The new name identifies the Company with its range of products and the new building puts all marketing functions under one roof.

The Pagans Hold Annual Match

PARKINSONS' Golfing Society (the Pagans) held their annual match at Meriden, Warwickshire, last month.

The R. J. Rogers Cup was won by Mr. Ernest Hughes (Area Manager, East and West Midlands) with a net score of 71, who narrowly defeated Mr. Ken Leech (Area Manager, North Western Region) —also 71—by a better last nine holes.

Prizes were also won by Messrs. Arthur Sadler (Wales), Cecil Ogden (Eastern), Tony Ward (South Western) and Eric Newbigging (Sales Promotion Officer).

C

A paper to the Wales and Monmouthshire Section, I.G.E., June 6, 1958.

The Application of Work Study in the West Midlands Gas Board

By H. B. BASSETT, M.A., B.Sc., Assoc.M.Inst.Gas E.,
DIVISIONAL WORK STUDY OFFICER, BIRMINGHAM DIVISION
and
W. G. J. BRYCE, Assoc.M.Inst.Gas E.,
WORK STUDY OFFICER, WALSALL DIVISION, WEST MIDLANDS GAS BOARD.

The paper was presented in three parts. Mr. Bassett first outlined the technique; Mr. Bryce then described its use in gasworks; and finally Mr. Bassett dealt with its application to the service side. Mr. Bassett began:

WORK study is the objective and systematic application of the art of good management in order to increase productivity and operational efficiency. This desirable end is achieved by the better use of our basic resources, *i.e.*, equipment, plant, raw materials and manpower. Work study applies in the factory some of the techniques used in the office by Organisation and Methods teams. There is no clear dividing line between these two specialised management services; indeed, they frequently need to combine to achieve the maximum efficiency demanded by both the engineer and the administrator.

Work study has two main techniques: Method study seeks to obtain the more efficient use of machines, manpower and materials and to improve the layout and design of plant; work measurement provides a quantitative assessment of the human work in a specified task and establishes the proper time to allow for the effective performance of that task. Whereas all work study, O & M or management practitioners use the technique of method study and have used it with success for generations, it is the technique of work measurement, especially when used for the purpose of developing incentive schemes, which brings to the fore the human and practical problems. Good and effective management must understand and resolve these problems before there can be any decided work study approach and any hope of success.

The gas industry has made steady progress for many years in improving its technical productive processes and the stage has been reached when it seems unlikely that greatly increased thermal output or efficiency can be attained with the present gasmaking plants. Unless there is some revolutionary discovery, therefore, the only ways open to cheapen the cost of gas production by the orthodox processes are either to purchase coal and/or oil more cheaply, which seems unlikely, or to obtain a larger thermal output per employee. In seeking increased productivity, the aim is not solely increased output, but rather increased output from the same or smaller use of existing resources. It is difficult to define output because it covers all aspects of manufacturing, distribution and servicing accomplishments, *i.e.*, such factors as quick efficient service, high quality and consumer relations which are often the more important. In other words, productivity may be defined as the quantitive relationship between what is achieved or accomplished and the resources available for the accomplishment of that particular task.

Readers interested in work study are advised to refer to the paper with this title presented to the Institution Meeting in 1957 ('GAS JOURNAL,' May 22, 1957, p. 481), to which the above paper is a corollary. Some of the fundamentals are repeated, but there is much new material.

Increased productivity is foremost in the eyes of this industry. A programme of research and development is being pursued by the Gas Council, the potential results of which may transform the industry. This programme does inevitably involve time, capital and a high standard of scientific skill and knowledge. However, a large problem faced the West Midlands Gas Board in 1951, which could not await the long term results.

The Board was very conscious of the large labour turnover, high earnings in the motor trade and the gradual deterioration in the standard of consumer service. It was with these thoughts in mind that the Board commenced enquiries of industrial firms in the Midlands, and also of business consultants with a view to introducing work study. Due to the specialised nature of the gas industry, the Board decided and appointed from their own staff six officers for training in Work Study. To this basic nucleous other work study officers have been recruited from other industries, and of recent months recruitment has been from within the industry. It is the intention of the Board to give members of its staff a spell of three to four years in work study and then return them to normal engineering duties when, it is hoped, they will be much better able to deal with men and the day-to-day problems of labour relations within a large organisation.

Consultation with Trades Unions

To establish work study we believe that proper training must be given and the closest consultation maintained between the Board and the trades unions so as to ensure a very close and clear understanding of problems. Our Board at a very early stage entered into agreements with the trades unions, proceeded with appreciation courses for all levels of management and trades union representatives at all works and depôts and instructed management clearly on the negotiation procedure to be adopted. Under the direction of the Deputy Chairman, a close eye is kept on the activities of Work Study sections and management is becoming more aware of the problems which inevitably arise with new methods and incentive schemes. It is only through good management that Work Study succeeds. It is no substitute. Its method of application is of paramount importance since it deals with human beings. The self-respect of the individual must be assured and his intelligence enlisted for the furthering of productive efficiency. This can only be done by the fullest support of and appreciation by management, close consultation with the trades unions and an appreciation of the workers' fear of the unknown. The Board work study officers are fully aware of the problems of men, unions and management and take these fully into account when preparing their reports.

Though the policy adopted by the West Midlands Gas Board may not produce immediately the successes achieved by consultants, it is our belief that a solid foundation based on trust and knowledge has been laid. Through trust and consultation the objectives of more individual satisfaction and increased productivity can be achieved and it is safe to say that the maximum rewards are now being reaped as a result of this trust and patient negotiation. Work study techniques and agreements

must be clearly understood and applied methodically, confidently and with the fullest co-operation of the trades unions and of line management if the rewards of increased productivity with lower operating costs are to be achieved and maintaind.

Mr. Bryce then continued:—

SECTION IV of the paper dealt with the techniques of work study, i.e., method study and work measurement. It is not my intention to describe these techniques in any detail—reference can be made to the paper or to the excellent booklets mentioned in the bibliography—rather I would like to describe the use which can be made of work study techniques in the various branches and trades of the gas industry.

Briefly, method study may be defined as the critical examination of existing methods or activities with a view to their improvement by making the best possible use of existing manpower, machines and material resources. Using a basic procedure in a logical sequence it begins with the factual recording of the way in which the job under examination is being done at present—not what is *supposed* to be done or what the management thinks is being done, but what is *actually* done. Having established all the factors and data relevant to the existing method, each operation is subjected to a series of questions designed to determine whether the job should be done at all, when it should be done and how often, who should do it and where, which is the best way of doing it, are the correct tools and equipment provided, is the plant equipment being utilised effectively?

Work measurement determines the amount of work involved in a specified job, and the time required to perform that work at a standard pace of working. The amount of work is expressed in work units which take account of the variations in the pace of different workers, the effect of fatigue and the conditions under which the job is performed. The standard pace of working is 80 work units per hour and the time required for completion of the job is the time taken if the job were performed at that pace.

Various techniques are used to determine the work content and standard time, the particular technique depending upon the nature of the job, e.g., direct time study by means of the stopwatch is used for work of a repetitive nature such as coke bagging or prepayment meter emptying. Use is made of standard data obtained from direct time study for building up or synthesising the work content of jobs which are in themselves variable but which consist of a combination of known elements, e.g., for painting, pipe screwing or merely for walking from place to place, including climbing up and down stairs. Analytical estimating, involving the use of a tradesman estimator, is employed for non-repetitive jobs such as are found in engineering maintenance and constructional work. When, in applying synthesis, it is not possible to establish standard data for every element of the job, gaps may occur in building up the work unit value for the job as a whole. These gaps may be filled in by the estimator who is competent to make an accurate assessment of the time required to complete the remaining elements.

By the use of these techniques, management is provided with information relating to the correct manning of plant and the anticipated performance of the labour employed. The same information can be used to obtain realistic actual labour costs, or standard labour costs, and when necessary, can provide a sound basis for incentive bonus schemes.

Paramount Question

To those who have little or no experience of work study the paramount question must be, to which gas industry processes and jobs can work study be applied? This is a very natural reaction and stems from the popular notion that these techniques are confined to jobs of a highly repetitive nature in the light engineering industries. It is true that for many years now, and particularly since the end of the last war, the field has widened, and more and more industries have come to realise that work study techniques are not confined to the assembly line, but are used by practically every industry in this country. Indeed, it is difficult to find any industry not employing work study to some extent.

The heavy engineering and steel industries, the printing, boot and shoe, clothing and furniture manufacturing industries have made use of these techniques. The chemical engineering industry, which is very similar to our own in many respects, has made enormous strides in the development of techniques suitable for use in the processing industries. More recently the nationalised industries and farming have come to use work study procedures to varying extents.

In the gas industry itself, at least five or six of the area boards are known to be actively engaged on work study. Referring directly to our own industry, and in particular to the West Midlands Gas Board, our manual employees may be broadly classified as follows:—

	%
(i) Gas-makers engaged on coal carbonising and other gas producing plant	17
(ii) Craftsmen and mates engaged on building and plant maintenance	15
(iii) Other gasworks' employees engaged on ancillary plant, steam raising, stores, general yard labour, etc.	22
(iv) Distribution employees on main and service laying	11
(v) Gas fitters, appliance and meter repairs and others engaged on general and consumer service	22
(vi) Prepayment meter collectors and meter readers	5
(vii) Road transport employees, including maintenance	5
(viii) Other employees, including subsidiary companies	3
	100

Dealing now with each group of employees, the fact that the gas-making and stoking operatives can be dealt with by work study was shown in one of the case histories described in the paper, and will be enlarged on later.

Rewarding Field

The building trades and maintenance employees in group (ii) total 15% of all employees, or approximately 25% of all manual workers employed in gasworks. The fact that we in the West Midlands have not yet applied work study to these departments, is not because of any doubts as to its suitability for use on such work, but rather from the knowledge that such an application would tie up our work study resources for a considerable period of time, necessitating as it does, the scheduling of all items of plant and the introduction of planned maintenance systems where none exist, the training of analytical estimators and the compilation of standard data. That this type of work can yield to work study and has been shown to be a most rewarding field, has been amply demonstrated by numerous firms in the chemical engineering and other industries.

Group (iii), other general employees, covers a multitude of jobs embracing cleaners, coke plant attendants, purification gangs, engine room and boiler house attendants, syphon pumpers, locomotive drivers, etc. It covers approximately 22% of all employees and is a field in which method study particularly can play an important part. On many of the jobs covered by the men in this group, no attempt is made to specify or define the duties of men concerned. Consequently, over the years which have elapsed since the job was originated, succeeding men have developed a method to suit themselves. Possibly the introduction of an instrument or small item of automatic equipment may eliminate the manual labour from the job—perhaps the job is being done too frequently or it could be combined with the duties of some other man. Even if method study only succeeds in defining the job and specifying how and when it should be done, it will be time well spent.

On many of these jobs, work measurement too can be used to advantage, not necessarily with the object of introducing incentive bonus payment, but rather to provide a yardstick with which management can measure the output of work or performance. The main value of work measurement is that it does provide a yardstick with which management can plan how long a job should take, how many men are required for a particular job, and what the labour cost for that job should be.

This information is just as useful to management whether the men concerned are working at daywork or incentive pace. It is the lack of this yardstick which results in additional labour

being recruited to cover new or additional work as it arises when possibly the existing manpower is not fully occupied. Very often a man may be quite aware that he is not fully occupied, but usually he is not going to ask for more work to be put on him—why should he? But if management do not know how long his established routine should take, how are they to know that he is unoccupied for part of his time, particularly if he always *appears* to be busy.

By and large, the performance of men in Group (iii) is usually fairly low and consequently is a field in which work study can achieve substantial savings. In the West Midlands, studies have been made successfully on jobs such as coke bagging, locomotive driving and shunting, water softening plant attendants, engine room cleaners, conveyor attendants and the like. Retort house dayworkers engaged on flue cleaning, retort filling, airborne sealing, etc., have been studied and it is our intention to spread our activities to coaling gangs, greasers and purifier emptying gangs.

That work study techniques can be applied successfully to the men in groups (iv), (v) and (vi) engaged in mains and service laying, gas fitting and meter reading and emptying, has been demonstrated by the Scottish Gas Board in the excellent paper 'Work Study: Three Years' Progress at Edinburgh' presented by David Beavis at this year's Annual General Meeting of the Institution of Gas Engineers. In the West Midlands a study is at present being made of the work of meter readers and collectors and of distribution mains and service layers, and a considerable amount of work has been done on meter repairing and meter fixing.

In the next group method study procedures are being applied to road transport and to the operation of radio vans in one of our divisions, while in another division an incentive bonus scheme is in operation for the delivery of coke to consumers' premises.

In the first group of employees, an extensive study has been made of the paint making, filling and packing operations of a subsidiary company engaged in the production of paints, disinfectants and rope preservatives.

From these remarks you can see that work study can be applied to almost every job encountered in the gas industry. Method study can certainly be applied to any activity be it on the works, the district or in the office. In this latter field, a separate department headed by the Board's organisation and methods officer has carried out numerous investigations into clerical procedures, the results of which could well be the subject of a separate paper.

Performance and Incentive Bonus Payments

Following the techniques of work study the paper next deals with the use of work measurement to obtain the output or performance of the individual worker or group of workers, and where incentive schemes are in operation, to determine the level of bonus payment. When jobs have been measured by any of the previously mentioned methods it is possible for the workers' output to be calculated in terms of work units. By relating output in work units to input in man hours, the labour productivity of a single operator or of a gang may be determined. Since it may not be possible for a man to spend all his time on work which has been measured, the time spent on unmeasured work must be recorded separately before a true picture of the operator's performance can be obtained. Hence, the operator performance is a measure of the average number of work units earned per hour spent on measured work and indicates the effectiveness of the worker when compared with standard performance, i.e., 80 work units per hour.

The schemes administered by the West Midlands Gas Board are based on two principles: First, they are all designed to pay a bonus of 33⅓% of the appropriate hourly rate for a standard performance; secondly, all waiting time outside the operator's control is paid for at the basic hourly rate.

The simplest method of payment is the straight proportional or straight piecework scheme in which bonus payment commences at 60 work units per hour, i.e., at the performance a man may be expected to achieve for his basic hourly rate without an incentive. Bonus payment above 60 work units per hour is proportional to the output of work, i.e., for an '80' performance, or one-third more work, the worker receives one-third more pay; similarly, for a '90' performance or 1½ times as much as a '60,' he would receive 50% more pay.

A second scheme which is commonly used is the '40 + ½' geared payment curve. In this scheme, bonus payment commences at 40 work units per hour and the bonus of 33⅓% is again paid for an '80' performance. Payment is made according to a straight line passing through these two points. Using this payment curve, all operator performances falling between 40 and 80 are inflated and all performances over 80 are depressed.

Both of these schemes are illustrated graphically in the paper together with simple examples. These and various other schemes may be used, the choice depending upon the nature of the job to which they are applied. Whichever is selected, however, the object remains to relate the financial reward as closely as possible to the work performed.

The Introduction and Application of Work Study

I have passed quickly over the techniques of work study since, although it is necessary for management to know what work study can achieve and to know the principles upon which it is based, the technicalities are the concern of the trained work study officer. We come now to the part in which management is vitally concerned, the introduction and application of work study in any particular works or department. I say vitally concerned, because it is the responsibility of those in line management to introduce and apply recommendations made by the work study department. It has been said that work study is 10% techniques and 90% an understanding of the human factors involved in the application.

That this is true there is little doubt. It will be apparent, therefore, that both the management and the work study department must devote considerable thought and attention to the human problems if any work study scheme is to be successfully introduced and maintained. An essential pre-requisite is that a clear and frank statement on the aims and objects of work study be made to those concerned—not only to junior management and the workers' representatives, but the supervisors and the men themselves. Most of us dislike change, and most of us resent having someone come along and not only tell us not only how our job should be done, but how long we should take to do it. It is of little use to make mechanical or structural changes to the plant or workplace in the sacred name of increased productivity if those in charge or those operating the plant are opposed to any new methods. Nothing is more likely to create organised opposition or distrust than a vague or evasive statement at the outset.

The fears most prevalent in the minds of the men are (a) the fear of redundancy or loss of status, (b) the fear that they may be overworked or if older men, that they will be unable to maintain their place alongside the younger men, and (c) the fear that once a bonus scheme is accepted, that management will attempt to tighten times and work values still further. In the West Midlands we have attempted to allay these suspicions by clear statements and directives and by appreciation courses for all levels of management, trades union officials and shop stewards. In addition, before any study commences, the supervisory staff and the men concerned are told why the study is to be made, what is to be done and that any proposals made by the work study officers will be discussed with them before being applied.

Even with this discussion and the co-operation of the trades unions, the introduction of method changes or of incentives is difficult—without it, impossible. Where a study culminates in the introduction of, say, a mechanical device, which removes the hard labour from the job, i.e., where it involves a saving of muscle rather than minutes, or materials rather than manpower, then it will be acceptable. But where it involves a reduction in manpower and additional work for those remaining, both management and work study officers can expect to be asked some extremely pertinent questions.

In the case of incentive schemes, the scheme is adopted for a three-month trial period following which the men may accept it for a further period of two years or may reject it entirely. Even when a scheme is accepted it is essential that a close watch be kept to ensure that work is being done in accordance with the job specification and standards laid down, and that the work content of the job remains consistent with the issued values.

Much more could be said on this subject, of the pitfalls and the poor labour relations which can arise through an inadequate

introduction or poor application of work study. Suffice it to say that, as in all dealings with the hourly paid worker, fair dealing and an honest answer are essential. It is for these reasons that, as I said earlier, work study is 10% techniques and 90% an understanding of the human problems involved.

Case Histories

In the section of the paper dealing with case histories, a description was given of the work carried out in applying work study and bonus payments to shift workers engaged on retort house duties.

When the paper was delivered in May, 1957, the scheme was still in its infancy. Now, 18 months after the scheme was installed, it continues to operate satisfactorily, the stokers have earned bonuses of approximately £2 per week, and the labour turnover has been reduced. Since the introduction of this scheme incentive payments have been introduced into two other major retort houses equipped with mechanical producers. In addition, studies are proceeding in a further seven retort houses, while at another, work has been suspended pending the installation of coke conveying equipment following a method study investigation.

In each of the retort houses now working under incentive conditions, the method of operation has been the same; manning has been reduced, the men's earnings increased and substantial savings have accrued to the Board.

At the works referred to in the case history, No. 1. retort house comprising 48 82-in. continuous vertical retorts, had been gas-making for 18 months. A duplicate house (No. 2) was under construction and nearing completion.

The 48 retorts in each house are built in two benches of 24 82-in. retorts fired by breeze-burning step-grate producers. Retort filling and producer charging are performed in the conventional way by the use of manually propelled skips running on overhead rails. Producer ashes are removed by battery operated trucks to an external ash hopper. Coke is discharged via travelling skips, one to each bench, on to either of duplicate 30 in. rubber belt conveyors with a capacity of 40 tons per hour. Skips are traversed along a rail track by means of hand-operated winding gear mounted on the skips. Each house is equipped with a Drummond dust-extraction plant and a vacuum-cleaning plant.

A detailed study of the methods used by the stokers was made (a) to ascertain whether the long-established and well tried practices used in the majority of retort houses were capable of material improvement, (b) to determine the best pattern of working on which time studies could be made, and (c) to investigate the frequency with which the various jobs were performed.

Recommendations were made for minor changes in the methods used by top stokers and producer men, in the frequency of performing certain tasks, and in the availability of tools and equipment. The major improvement made was on retort discharging, where it was found that this work could be performed by one instead of two men. A study of the sequence of activities of the two men showed that they each had long inactive periods waiting on one another and that there was sufficient time available, because of belt speed, for one man alone to discharge retorts on both sides of the house without lengthening the discharge time. Work measurement subsequently revealed that the effort involved was within the capacity of one man, even without mechanisation of the coke skip traversing gear.

Over a period of three months, time studies were made of all the routine jobs performed by stokers and from which work unit values and the time taken for completion of the work at standard performance were obtained. The same procedure was followed for the discharge seal cleaners and vacuum cleaners employed in the retort house.

Having calculated a work unit value and standard time for every job, such as rodding, charging, erecting scurfing furniture, producer cleaning and charging, discharging, seal cleaning, etc., the performances of the stokers were calculated for the duties they were doing at that time. It was found that performances ranged from approximately 63 work units per hour for producer men down to 44 and 25 work units per hour for top and bottom stokers respectively. It was apparent, therefore, that the stokers would have to accept additional work to qualify for bonus payment.

In process work of this kind, however, the work content of a given job can vary hour by hour, or shift by shift, and factors outside the control of the men, such as excessively high-swelling coal or an electrical breakdown on the conveyor system, can influence individual performances. The values obtained by time study were taken over a three-month period and covered most of the usual contingencies, but it is emphasised, they were averages. It was recognised that work would occur in peaks and troughs about that average. Because of this, it was deemed impracticable to load a stoker much beyond 65-70 work units per hour in order that he might have time within his shift to deal with the peaks. An allowance (50 min. per shift) was made to cover meal breaks, preparation and washing at the beginning and end of shifts (thus leaving 7 hr. 10 min. per shift available for bonus work). The approximate number of work units up to which each man could be safely loaded, was then calculated as 7.17 hr. × 65 work units per hour = 466. New manning schedules were prepared for No. 1 and 2 retort houses with such a maximum in mind.

Bonus Scheme

In devising the bonus scheme, four desirable features were borne in mind:

(i) The bonus must be sufficiently attractive for the men to accept reduced manning and higher work loads, bearing in mind the limiting ceiling of 65-70 work units per hour.

(ii) The bonus should increase or decrease with the fluctuations in the amount of plant at work, *i.e.*, the bonus should vary with the work load.

(iii) The bonus should relate to the individual or to as small a group as possible.

(iv) The bonus should only be payable for work performed to a set standard.

In a true incentive scheme the will to work comes from within the man himself since he knows that his bonus earnings are strictly related to his output of work, and that both the quantity and quality of the work performed are measurable. Thus, a man engaged on, say, the filling of 1 cwt. coke bags, is aware that both the number and weight of the bags filled can be physically checked. In some types of process work where the operation of the plant is under the sole control of the operator, and where the raw materials are of constant quality, bonus payment may be based on the number of tons of product made within certain quality limits.

From the outset it was realised that a bonus scheme based on retort house efficiency factors, such as therms per ton of coal carbonised, therms per retort per day or producer fuel consumption, would be very desirable from the management's point of view. Unfortunately, these factors cannot be used as the basis of a retort house bonus scheme. The quality and quantity of gas produced is readily measured, but the influence of the stoker on these factors is not so easily defined. Retort temperatures, coal throughput, steaming rates and the condition of the plant all have a bearing on the thermal yield. Furthermore, the quality of the raw material, coal, is anything but constant.

Number of Jobs

Since we cannot measure the stokers' efforts directly against the quantity and quality of gas produced, we have been obliged to base the bonus on the number of jobs performed per man per shift, that is, on the number of retorts rodded and charged, or on the number of producers cleaned, *etc.*

In this case, the average effort expended on these jobs is measurable, the number of retorts or producers at work is known, but the quality of the work done on *certain* jobs cannot be measured against any definite yardstick. Of the jobs performed by stokers, those connected with plant cleaning, sweeping or discharger seal cleaning, can be readily assessed for quality of workmanship. The operations of retort charging, producer charging and retort discharging, are not likely to be neglected by the stoker—the neglect is so soon apparent and easily traced to the defaulter.

It is in retort rodding and producer firecleaning where the quality of the work cannot be immediately assessed. While the results of any neglect in this direction are soon apparent, it is difficult, and often impossible, to apportion the blame to any particular individual or shift. But such has always been the

case. With or without a bonus scheme, it remains the shift foreman's responsibility to see that these jobs are properly completed. Unfortunately, a bonus scheme does not automatically ensure this.

In effect, then, what we have endeavoured to do is to lay down a new stint of work for the stokers and to pay a bonus based on work measurement commensurate with the higher work load and varying with the amount of plant at work. The position of the shift foreman is strengthened by the introduction of a system of bonus payment. Previously, he could either admonish or discharge the man who neglected his duties; now, in addition, he can withhold his bonus.

The introduction of the reduced manning schedule and bonus scheme was timed to coincide with the starting up of No. 2 retort house. In this way, the surplus labour from No. 1 house was absorbed and no redundancy problems arose.

At this point Mr. Bassett resumed:—

One of the early investigations undertaken in the Birmingham Division by the organisation and methods officers of the Board was an examination of showroom, branch office and servicing depôts activities with a view to securing the maximum economy and at the same time, offering consumers the best possible service. In view of this investigation, the work study section refrained from any major study that might influence the results of the organisation and methods investigation. They concentrated their activities on meter repair and testing. A similar investigation at Dudley was described in the paper last year. As a result of new methods and incentive schemes, very appreciable increases in productivity have been achieved in the various post repair sections of the meter shop. As these incentive schemes are, as yet, on a trial basis, I do not wish to discuss them too deeply.

While the organisation and methods investigations were progressing, the Divisional General Manager expressed a desire to examine appliance fixing. It was decided that the best way of tackling this was to recruit a fully qualified and experienced gas fitter into the work study section. The agreement of the Board and the co-operation of the trades union was received. The gas fitter, being fully familiar with district work, was soon eager to portray to us the most difficult of fixes which naturally was what we desired the most. Incidentally, the laboratory where this gas fitter works is a central one under the wing of the Birmingham Division, but is available to all divisions for special investigations.

Peaks of Fitting Work

In view of the large rehousing programme in the City of Birmingham and surrounding boroughs, the initial investigations were into the methods of fixing domestic meters. Owing to the manner in which blocks of municipal flats and houses were made available for occupation, it was often necessary to fix a large number of meters at short notice within a limited area. Such local peaks of fitting work often occurred on a Saturday morning and great difficulty was experienced in maintaining good consumer service.

The job of meter fixing fell naturally into three sections:—

(a) Making connections for the meter.
(b) Actual connection and pipe-work.
(c) Erecting shelves where required.

Each of these sections had to be examined in the light of material costs, technical requirements and fixing time. From the technical aspect, the method of fixing a meter on lead pipe connections was considered most desirable, and hence the problem was to make this practice competitive in economic terms with other systems of meter fixing. Detailed studies of meter fixing by traditional methods have not been made, but records show that where a shelf was erected, the average time taken was in the region of 2½ hours. This breaks down roughly to:

1. Making up connections	45 min.
2. Pipe-work and actual fixing	45 min.
3. Erection of shelf	45 min.
4. Testing for soundness	15 min.

The most difficult and potentially time-consuming portion of the job was the making up of connections; this portion, was therefore, tackled first.

The conventional method of meter fixing was for the fitter to make up his connections on site, from a 3½-ft. coil of lead pipe, one union joint, the cap and lining fitted to the maincock, and two straight meter unions which were despatched on the meter. The conditions under which this operation was performed were not favourable to such a relatively delicate operation as 'blowing' a joint.

A number of connections were, therefore, made up in the workshop and trials made to assess their usefulness on the district. It was found that the majority of cases could be readily dealt with if two standard lengths of connections were made available, and that with the use of extra fittings (e.g., barrel nipple or short-piece) the standard sizes would cover all domestic meter fixes. The use of such additional fittings was already common and they were automatically included in the materials sent to fix a meter.

In view of the above findings, it was decided to extend the use of prefabricated connections, and a method study was made in order to develop a manufacturing technique suitable for quantity production. Present output, employing one man full time on the job, is 150 sets of connections per week. The existing equipment is capable of producing up to 500 sets per week by the employment of more labour on it. Lengths differing from those specified can be produced on the existing equipment with no difficulty up to a miximum of 21 in.

Tests have been carried out to determine the strength of the soldered joint; these have shown that it is at least as good as the best 'hand-blown' joint, and furthermore, this quality can be consistently maintained.

By the use of prefabricated connections, the time required to fix a meter has been reduced by at least 45 min. at the expense of 15 min. work in the workshop. Special containers, each holding 10 sets, have been provided for bulk transport and storage of connections. These eliminate much of the danger of damage to the lead pipe in transit, which has previously been a major disadvantage of this type of connection.

Parallel with the development of prefabricated connections, steps have been taken to reduce the amount of pipe-work required before making the actual connection.

Traditionally, the procedure was for the fitter, at the time of fixing the meter, to fix a ½-in. maincock using a reducing socket and barrel nipple on the end of the service pipe. This method has now been replaced by a 1-in. × ½-in. maincock, which is fitted by the service layer, eliminating the other two fittings. This maincock is of the reversible-niting-washer type, eliminating the need for gas-tight capping. A further advantage of this procedure is that at no time is it necessary to allow gas to escape while fitting.

In addition to these measures, experiments have been carried out to determine the best relationship of service to house pipe when using prefabricated connections. Although these connections have great flexibility in application, it is desirable to keep bends to a minimum and avoid complex shapes and extra fittings. Hence, twelve common relationships of service-house pipe-meter have been studied, and limits on the positions of these established. Within these limits, prefabricated connections are simple to use and no additional fittings are required except a barrel nipple when the house pipe outlet is a 'T.' 'Trapping' of connections has been allowed for in the limits.

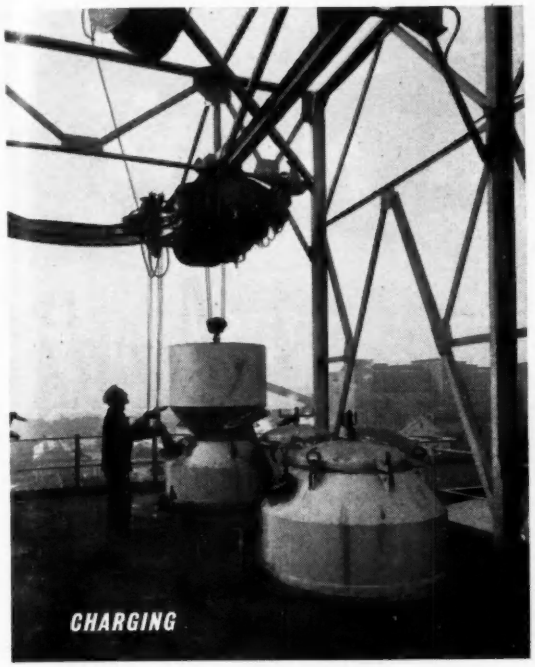
Under these conditions it has been shown feasible to fix a meter complete, less testing, in 20 min. if no shelf is needed. This allows reasonable contingencies and permits a first-class job to be made, including re-rounding of the pipe where bending causes a slight ovality.

It should be noted that vertical limits can only be given from a datum line representing the base of the meter. Co-ordination between service layer and builder is, therefore, essential if the full benefits of standardisation are to be achieved.

Traditional Method

The third item in meter fixing is the erection of a shelf for the meter. The traditional method was to build up a shelf by first fixing two wooden battens to the wall, on to which were fitted conventional sheet metal shelf brackets, holding an asbestos cement shelf. This involved drilling and plugging six holes in the wall, and was not a simple arrangement to level up satisfactorily. As previously mentioned, the time for this operation was about 45 min.

Experiments were, therefore, made with a one-piece shelf,


CHARGING

The distinctive feature of the Gastechnik process for the extraction of H_2S from gases is the use of oxide of iron in pelleted form.

The upper view shows pellets being charged into the tops of the purification towers. New pellets are brought, as required, by powered truck from store to the purifiers, raised to the top of the plant by means of a flameproof hoist, and charged through gas-tight locks into the towers, enabling the gas streams to be maintained continuously in commission.

The pellets flow freely through the towers at controlled rates according to the gas flow and H_2S content, and are discharged, in readily controlled quantities, through the bottom lock and valve shown on the lower view into the 50 cwt. skip, which is conveyed on a stillage by the powered truck. Under all circumstances pellets can be charged into and discharged from the towers without interfering with the gas flow.

The skip with the stillage can be parked nearby if required, or otherwise taken to the electric hoist for the pellets to be transferred to an earlier tower in the stream. If, however, the pellets have been discharged from the first tower of a stream they will go direct to the other section of plant for sulphur extraction.

GASTECHNIK PURIFIERS

The illustrations emphasise the neat simplicity of design which is characteristic of the entire plant. Notice particularly the absence of complex and costly handling equipment, and the self-evident ease of operation. The attendant moves in complete freedom on the top platform, where only the single operation of charging is carried out with complete lack of spillage.

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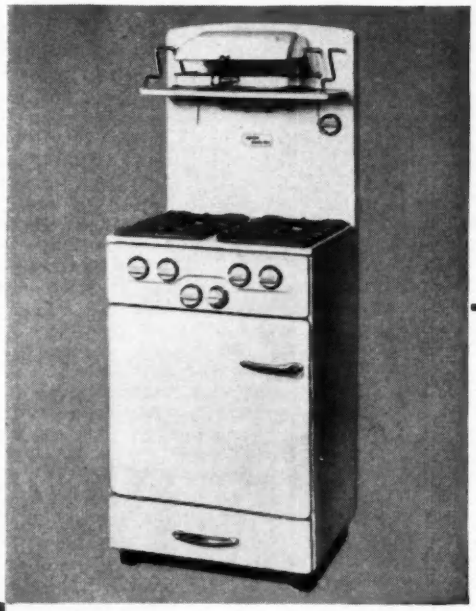

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Eye-Level Grill, raised oven, storage drawer. Incorporates features which make it outstanding in its price range.

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and the present design was evolved. This consists of a fabricated structure from galvanised sheet, with a rubber insulating strip all round the rear edge, which is the only portion in contact with the wall. Alkaline or electrolytic corrosion of the shelf or meter is thus avoided. Fixing is by means of three screws and washers, the holes in the shelf being larger than the screw diameter so that the final levelling is simplified and the need for precise positioning of wall-plugs minimised. The shelf will accommodate a D.1 P.P. meter or a D.2 credit meter; larger sizes (ie., 3 lt. or 5 lt. P.P. case) can be accommodated by reversing the shelf which has proved equally rigid whichever way it is fixed.

Time studies have been made of fixing this type of shelf, which show that a time of 10 min. is adequate under all except very abnormal conditions. This is a further saving of 35 min. over traditional methods. The shelves are purchased at a price competitive with the material cost of the traditional method.

In addition to the savings arising from reduced work for the fitter, other benefits are gained in simplification of administrative and stores procedures in preparing materials for particular jobs. No detailed examination has been made of these aspects at this stage, but it can fairly be stated that as standardisation of this nature proceeds, the work load on stores will be reduced and it will be possible to even out that load so that the most effective manning can be secured.

This method of meter fixing makes worthwhile the further examination of the use of vans exclusively for meter fixing and changing, since the greater number of meters which can be fixed per van-day would appear to make this an economical proposition.

This small investigation has indicated to us the need to be cautious in introducing incentive schemes to tradesmen. The difference in times shown by this study could soon ruin an incentive if based on estimation of past performance.

It is my honest belief that there is room for a full scale attack by the gas industry into appliance fixing, etc. From the short investigation undertaken into cooker fixing, maintenance, cleaning, etc., and so far only 5% of the cookers sold by the West Midlands Gas Board have been examined, I am sure that the job will be a long one. Manufacturers may have to be approached. It might be well to remember that manufacturers have applied work study in their factories for years, and have simplified, standardised and improved the methods of assembly to their own advantage and often at the expense of the maintenance fitter on the district. We have no concrete results to offer as yet, but I am sure that sales and service officers, manufacturers and research workers will seriously have to reconsider their views on appliances so as to produce appliances that are easy to fix, maintain, repair and service and which at the same time, are attractive to the housewife at the right cost.

Success Depends on Management

Summing up, it is our opinion that the field of work study, O. & M., or call it what you will, is unlimited—good management must apply it logically, critically and with purpose if our industry is to fill the gap until the larger rewards of big developments from the Gas Research Council are forthcoming. With the co-operation of the men and their unions, work study can reap the rewards of increased productivity, lower costs and at the same time reward an individual for his increased effort.

May we repeat, however, work study is only 10% techniques. Its success depends on management, who have four main responsibilities:

(1) To plan the commencement of work study within a section so that the minimum of labour displacement occurs.

(2) To implement quickly new methods and techniques resulting from method improvement and to train personnel before the introduction of incentives.

(3) To understand fully the problems that will inevitably arise and be competent to deal with them immediately; and

(4) To operate and maintain new methods and in particular incentive schemes so that there is no loosening of the time values.

DISCUSSION

Mr. F. H. Bate (Chairman of the Midland Section, I.G.E.) described himself as an engineer who had seen and had appreciated the value of work study. He said his first introduction had been at the college at Loughborough where he had been given a brief digest of the subject. He emphasised, however, that if one was going to utilise this technique to the maximum advantage, it was not possible to take a short cut. Since that initial introduction he had had three direct experiences. The first had concerned the closedown of a 500 mill. cu.ft. a year works and the transfer of the men to a retort house in which work study had been applied. This had necessitated a long journey for the men, but despite this and other difficulties they had settled down quite happily and, thanks to the benefits accruing from work study, the transfer was completed with no difficulty. His second experience had been in connection with a retort house in which it was known that production could be increased by at least 1 mill. cu.ft. per day. To achieve this end would have been an extremely difficult and expensive engineering job, but work study had broken the problem down to its fundamentals and had greatly contributed to its solution. His third experience had concerned a retort house producing 1,000 mill. cu.ft. a year in which production had been substantially increased without any corresponding increase in the labour employed. There was, however, one immediate snag with work study, said Mr. Bate. If as a result of applying this technique the earnings of retort house workers were increased by 30s. a week, what about the work supervisor, chemist, etc.? There was a possibility that this would result in an uplift in salary for everything. Summing up, he felt that work study was an excellent tool of management but it had to be applied scientifically with full consultation.

Mr. J. Powdrill (Cardiff) said that work study was already being brought into practice at Cardiff and his initial experience led him to agree with the previous speaker that there was no short cut. They had decided to tackle the hardest job first—the consumer service side. So far they had progressed to the stage where everything had been broken down into standard times and costs. They had now to devise standard packs for fitters, and had discovered the necessity of using radio vans. As a result of these they were now finding that consumers who had gone to a 'phone box to make a complaint had found the gas board van at their home by the time they returned. Indeed at the last three fires in Cardiff the Gas Board had been on the scene before the Fire Service. Mr. Powdrill added that in the initial stages there had been little enthusiasm on everyone's part, but as the benefits gradually became apparent enthusiasm was building up.

Replying, Mr. Bessett said that work study was not only concerned with the manufacturing stations. Good consumer service was just as essential and radio vans assisted in maintaining the high standards. He went on to describe how work study had been applied to coke deliveries. During the winter of 1954-55, 3,000 tons of coke orders had been cancelled and deliveries had been in the order of 24 days. The output from three works in the city had been increased from 20,000 bags a week to 30,000 bags a week with a reduced labour force. They had investigated the system by which orders reached the works and had reorganised this aspect of sales and service in the city, with the result that orders now went through much more swiftly; this new system went into operation on April 1.

Mr. W. Clark Jackson (Neath) said he had been much impressed by the authors' presentation of their paper and felt that it would be to everyone's advantage if one of their vans could be fitted up with examples of how work study had been applied to fitting work and made to tour the area. By spreading the gospel in this way he felt that there would be ready recognition of the rewards to be obtained from work study.

Mr. H. Blythe (Colwyn Bay) was particularly interested in the application of work study to small undertakings and felt that since the first essential was to ensure adequate supervision this might present certain difficulties. It was unlikely that local managers could give sufficient time to such a project and the solution must lie in having someone from headquarters deal with the matter at local undertaking level. He had been particularly interested in the authors' comments on meter repairing, and wondered what had been the effect of this on the makers.

Dr. A. B. Badger (Industrial Relations Officer, Gas Council)

said that for all its benefits the application of work study was not easy. The first difficulty was a philosophical one. It was felt in some quarters that work study bribed a man to work better, which he should be doing anyway. It was significant that in America, the home of the incentive bonus scheme, they were abandoning incentive schemes because they created bad industrial relations. In the States workers felt that when a certain point of production had been reached there was an increasing return for the management and a decreasing return for the worker. It was possible to have a job where industrial relations were excellent, but when work study was applied to one section of employees and denied to the rest, a potentially dangerous situation was produced. The first stage in introducing work study was to employ outside consultants. These were usually expensive, and once the problems had been sized up and people like Mr. Bassett and Mr. Bryce had been trained, the outside consultants should go. It was essential that anyone responsible for work study should have the feel of the industry. In effect one was asking an employee to face what was tantamount to a revolution. By suggesting to a man that in the past he has not done his job properly, that you are going to apply scientific principles to his efforts, and that you are asking him to increase not production but productivity—a very different thing—you run the risk of arousing fear, uncertainty and resentment. It was essential that the suspicion and fear of unemployment was overcome. Manual workers did not possess the type of mind which could grasp mathematical formulæ and scientific principles, but they must be able to calculate, without external assistance, what they were going to earn, otherwise they would feel they had been diddled. Successful work study was 90% human relations. He felt sure that this fact had been fully recognised in the West Midlands Board.

A vote of thanks to the authors was proposed by **Mr. A. Pickard** (Swansea) who mentioned that he had arranged to see the West Midlands Gas Board workshops in which the advantages of work study were demonstrated the following week, and the vote of thanks was seconded by **Mr. W. T. Hird** (Cardiff).

From a paper to the 11th Annual Conference of Incorporated Plant Engineers, May 14-16, 1958

The Planning of Plants and the Operation of Processes

By H. BIRCHALL, B.Sc.(Tech.),
ENGINEERING DIRECTOR, DYESTUFFS DIVISION, I.C.I. LTD.

IN this country we are faced with the challenge of world competition, and this is likely to last indefinitely. If we marshall our resources and make the most of them we should be able not only to hold our own but to occupy an even more prominent position in the industry of the world than we do today. We are perhaps not utilising to the full the whole of our great potential in modern technology. We are credited on a world basis with possessing some brilliant scientists, and our ability to find an adequate solution to most situations on common sense lines is also admitted, but between these extremes there is a huge field of application of technology, and it is suggested that it is here that our outlook is not up to date, not progressive enough and capable of vast improvement. We may be relying too much on our ability to improvise and to deal somehow with most situations instead of employing a more modern and scientific approach as a substitute for such improvised methods. Our University and Technical Colleges can supply the basic knowledge and inculcate the ability to acquire knowledge, but industry must build sound technical training and experience onto this and thereby promote its engineers to the highest technical levels. The assumption that a plant engineer can do his job in the absence of a comprehensive training was perhaps never true and is certainly not true today. He would be quite unable to keep modern techniques in true perspective without some experience in developing and carrying out the design and construction of new projects. We are indeed asking a lot from our plant engineers today, and tomorrow we shall ask more. How these engineers can best be trained and from where they will have acquired their knowledge may be illustrated by describing the technical sequence usually adopted in carrying out an enterprise, mentioning some modern trends in various stages of this sequence and suggesting that future plant engineers should have taken an active part in some, if not all, of these.

Logical Steps

The carrying out of an undertaking is shown in the following sequence:—

1. Systematic compilation of the basic design data.
2. Resolution of the layout and the general design in the drawing office.
3. The placing of contracts and the co-ordination of these contracts into one construction programme.
4. Starting up of the completed plant.
5. The maintenance of the completed plant.
6. The future technical development of the plant.

Each of these successive steps is examined but it is easy to set down such logical steps and give the impression that they are dealt with systematically and efficiently, whereas in actual practice nothing of the sort may occur. In the absence of first-class team work relatively poor results will be obtained. Perhaps as a nation assisted by our large background of sport, we have developed over the years the fundamentals of team work. Let us use these and create a technical team which is trained to mount an attack and to swing into action with the full weight of trained experience. Team work implies delegation of work, but to obtain the best results work must be delegated scientifically and to an overall plan.

Essential Feature

Pursuing the sequence mentioned, the technical compilation of the basic design data is not explained in detail but mention is made of the evidence that the capital cost of a plant is determined during the formulative stages of the preparation of basic design data, and it is difficult if not impossible later on to make savings of any magnitude. Basic design data must therefore be set down systematically and critically analysed using modern methods of work study techniques to sort out the best possible answer. An example is given of a saving of over 20% on initial capital over and above what might be termed the common sense result by intensive and scientific application of work study methods associated with a skilful team. Modern practice makes use of models which today form an essential feature in design office work. There are two types of models, the preliminary and the final model. The preliminary model used in conjunction with analytical methods enables the opinion of many people who can contribute to design, to construction and to maintenance to be incorporated in the early stages along with comments of other officials not immediately concerned, such as the Medical Officer and the Chief Fire Officer. A successful result at this stage means that

all concerned have strong evidence to convince them that a first-class layout has been decided upon by logical approach and not just a technical expression of opinion. The detailed model will be described and its value in design and construction explained. The resolution of the essential data opens the door to extreme activity in proceeding vigorously with the more detailed design, and this complicated and vital phase leads on to the placing of contracts and carrying out the construction programme. The resolution of design difficulties and the activities in a drawing office from engineer to detail draughtsmen are somewhat out of the scope of this paper, but mention can be made of the planning necessary to ensure that the basic information is spread as rapidly as possible to all participants so that their efforts in turn swell the total effort.

Separate Construction Programme

While a separate construction programme will have its use in the construction field, its value to the project as a whole will be limited unless it has been incorporated in the overall programme. A large undertaking may require two years to complete and if all data is frozen before detailed technical work is embarked upon such a plant will be two years out of date when it is started up. It is essential to incorporate wherever possible developments with the minimum interference with the final completion date, and here lies the advantage of the overall plan embracing all aspects from research/development to the site construction plan. Granted reasonable proficiency in the design office and in the field of construction the completion date of an undertaking will depend directly upon the ability of the organisers to assemble the maximum technical effort as quickly and effectively as possible at each stage. To achieve this, scientific delegation of work is necessary and this might include incorporating the manufacturing programme of contractors with the master plan. Little has been done so far in this direction and the possibility of developing a technique which may save six to nine months fabrication time by scientific planning is suggested. The normal sequence in a contractor's works is dealing with the initial enquiry, preparing tenders, discussing the tenders, their eventual acceptance, the translation in the contractor's organisation from his sales organisation to his production team, his preparation of drawings, his ordering of material, and at long last his actual fabrication. The possibility of time saving procedure immediately suggests itself, but taking short cuts in a contractor's organisation is only possible with first-class liaison between customer and manufacturer, and a great deal of mutual confidence; examples are given. A very senior and experienced engineer must be in charge of this type of planning and the use of women graduates in this sphere is worth consideration. Models have a large potential towards placing contracts on a broad basis before final details have been worked out.

A certain amount of this planning relates almost entirely to the construction organisation in the field, but the overall plan is more likely to decide the ultimate completion date, as it will regulate the flow of materials to the site. The logical engineering sequence is basic design data, placing contracts, delivery of materials and the erection of the equipment.

The value of the model to the construction organisation, with particular reference to pipework, is referred to.

The onerous period of starting up of the unit is alleviated by the results of good planning, good training of all personnel concerned, and above all by first-class liaison between the construction organisation, the original planners, the employment in the later stages of construction engineers with knowledge of the design and the ability of the organisation as a whole to slide easily from design/construction into the sphere of operation. The maintenance and future technical development of the completed plant are associated with the same piece of apparatus but have different significance. Detailed aspects of maintenance organisation are not described but it is assumed that an annual and systematic maintenance plan has been got out and is being operated in an intelligent way. In the general context of maintenance rather than technical development the plant engineer must be familiar with the capital value of the plant he looks after, the current replacement cost of various items, the cost of services, steam, electricity, water supply, etc., whether directly under his control or not, and all records which may assist him to carry out the more routine aspects of his job with maximum efficiency. Systematic digestion of this information will enable the engineer to plan his overhauls with a proper concentration on the most important aspects, and enable him to instruct his foreman on the best procedure. If he cannot delegate work to his foreman, either due to the absence of training or lack of his own technical skill to concentrate on his job at a higher level, he will not be a modern plant engineer but a routineer. The achievement of a systematic and scientific approach to the maintenance of his plant is still not the completion of his job, and he is still a routineer if he is incapable of developing the complete installation along with his technical colleagues. Even employing modern planning methods will not prevent a large plant being technically out of date by one year when it is started up and probably two years out of date by the time it has settled down.

Granted sound overall engineering training, a plant engineer will profit enormously by special work study courses. These courses have to be carefully organised and important details worked out, and today in the author's organisation a hundred maintenance engineers have attended special courses in groups of 12 selected from different works. Examples are given from dozens and dozens of improvements which have resulted as a follow-up of these courses. To some extent these improvements relate to the more routine aspects but the more important results were in the field of plant development and the stimulating effect of a modern approach to the plant engineer's job. This logical approach arising out of work study has enabled different types of technologists to meet on a common ground and ask one another pertinent questions. Answering these questions and developing the answers logically has provided a key towards the solution of the great problem of developing existing processes. As an engineer gains in experience and seniority he will encounter the severe problem of delegating work to others. Many men are reluctant to do it but the modern approach demands more than just delegation. Work must be delegated systematically and scientifically so that the plant engineer is freer to concentrate upon more vital aspects. Again and yet again, if his technical knowledge and training only allow him to do his job on a certain level he cannot delegate more than he knows and his rôle is limited. It is recommended that plant engineers are trained to a technical level which would enable them to take complete charge of the development of new undertakings, as well as having the ability to operate the completed project. An example is shown of the training and experience given to a typical University graduate in his engineering career. With such a background an engineer can take his place effectively in the modern approach to the creation and operation of new undertakings.

Appliance Sales Increase After Purchase Tax Cut

SALES of many gas and electrical appliances were greatly increased by the reductions in the rate of purchase tax imposed on them. But the immediate buying spree has not persisted, although in many cases sales are still substantially higher than a year ago, reported the *Financial Times*. In the past few weeks the bus strike has hindered sales in London, but manufacturers and retailers are generally convinced that sales will be higher this year. Since buyers are inclined to hold off in the weeks before the Budget there was some pent-up demand which was readily stimulated by purchase tax changes. Some falling off in sales was therefore to be expected once the novelty has worn off, and it is too soon to be sure of the extent of the increase in buying.

Demand for Refrigerators

In the case of refrigerators, on which the purchase tax was halved to 30%, both manufacturers and retailers report substantial increases in sales in the weeks immediately after the Budget. Both gas, and electric refrigerators have shared in the higher demand. One large area electricity board reports that sales in April were 75% higher than a year ago and expects that, although that rate of increase will not be maintained, the May figures will still show a substantial growth.